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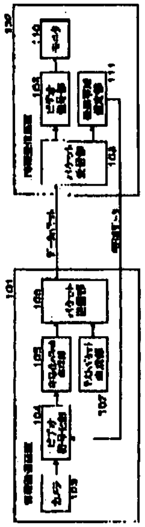
(54) DATA TRANSMITTER, DATA RECEIVER, DATA COMMUNICATION EQUIPMENT AND DATA COMMUNICATION METHOD



(57)Abstract:

PROBLEM TO BE SOLVED: To reflect changes in a transmission band on communication control even under a condition that the transmission band changes dynamically by controlling an encoding processing and/or a transmission processing based on control information to be informed from a transmission destination.

SOLUTION: Transmission is performed by inserting a test packet with size different from an encoding packet into a group of the encoding packets to be transmitted by an information transmitter 101 at a transmission side and the transmission band S is estimated by utilizing difference in two kinds of packet size by an information receiver at a reception side. And information to estimate the transmission band is informed to the information transmitter 101 by the information receiver 102 by which the transmission band S is estimated. Thus, quality of the information to be transmitted and quantity of codes are properly controlled and a load of a communication network is normalized without falling into a congested state even when the transmission band S dynamically changes by the information transmitter 101. Thus, stable quality is maintained even when real time continuous information like a video signal and an audio signal is transmitted.

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CLAIMS

[Claim(s)]

[Claim 1] the control information which becomes from the band data which are the data source which transmits the coded data which comes to encode the information as which real-time requirement or a time-series continuity is required to the communication network with which a transmission band may be changed according to a load profile initiation, and are notified from a transmission place, a coding time stump, a coding packet size, coding parameters, or such combination -- being based -- coding processing -- and -- or the data source characterized by to have the transmission-control function which controls transmission processing.

[Claim 2] The data source characterized by having the function which records the packet size and the time stump which gives transmitting time of day on each of a transmitting packet, and is transmitted to the data source according to claim 1.

[Claim 3] The data source characterized by having the function which the redundancy packet in which it is the packet prepared for the data source according to claim 2 apart from the coding packet obtained from coded data, and the packet size differs from it of a coding packet is made intermingled, and is transmitted.

[Claim 4] The data source characterized by having the function which the coding packet which differs in a packet size is made intermingled in the data source according to claim 2, and is transmitted to it.

[Claim 5] The data source characterized by having the table means which stored in the data source according to claim 1 or 2 the control parameter which makes band data and a pair, and having the function which reads the coding parameter according to the band data notified from a transmission place from the table means concerned, and is used for control.

[Claim 6] The data source carry out having the function which records in the coding time stump which had the notice in the coding packet which resumes coding processing and transmission processing from the coded data which cancels all the coded data and coding packets under present processing to it, and is newly inputted into it after that when a coding time stump is notified to the data source according to claim 1 or 2 from a transmission place, and a coding packet, and is generated by the beginning after a restart as the description.

[Claim 7] The data source characterized by having the function to change into it the packet size of the coding packet sent out after that at a coding packet size with a notice when a coding packet size is notified to the data source according to claim 1 or 2 from a transmission place.

[Claim 8] The data source characterized by having the function which controls coding processing based on the coding parameter concerned when a coding parameter is notified to the data source according to claim 1 or 2 from a transmission place.

[Claim 9] the transmission band which is the data sink which receives through the communication network with which a transmission band may be changed according to a load profile initiation, and presumed from a receiving data packet in the data packet which encoded the information as which real-time requirement or a time-series continuity is required -- and -- or coding [notify to transmitting / the control information searched for based on the transmission band concerned / origin, and] processing of a transmitting agency -- and -- or the data sink characterized by to have the notice function of control information which controls transmission processing.

[Claim 10] A data sink according to claim 9 is a data sink characterized by presuming a transmission band based on the time stump which gives the packet size and transmitting time of day which are recorded on the receipt time of a data packet, and a data packet.

[Claim 11] A data sink according to claim 10 is a packet size n1. Data sink characterized by presuming a transmission band S based on a degree type when the transmitting time of day when the transmitting time of day currently recorded on the data packet is recorded on t1A, and the receipt time is recorded on the data packet of t1B and a packet size n2 (n2 !=n1) is given by t2A and the receipt time is given by t2B.

$S=(n2 -n1)/\{(t2B-t2A)-(t1B-t1A)\}$

[Claim 12] The data sink characterized by having the function which notifies the coding time stump which requires the dissolution of delay of a transmitting agency when the amount of transit delays concerned exceeds a predetermined threshold with the function to presume the amount of transit delays from the packet size of the transmission band presumed by the data sink according to claim 9 or 10 and the actually received data packet.

[Claim 13] The function to ask for a packet size required for a data sink according to claim 9 or 10 when maintaining the amount of delay at a predetermined value under the situation of the presumed transmission band, When the difference of the packet size for which it asked, and the packet size of the actually received data packet exceeds a predetermined threshold, or when those ratios exceed the predetermined range, The data sink characterized by having the function notified to a transmitting agency by making the packet size for which it asked from the presumed transmission band into a coding packet size.

[Claim 14] The data sink characterized by having the function which asks for the coding parameter controlled in the range which does not exceed the transmission band presumed in the bit rate of the coded data which is a transmitting agency and is generated by the data sink according to claim 9 or 10, and notifies the coding parameter concerned to a transmitting agency.

[Claim 15] The data communication unit characterized by having the data source according to claim 1 and - TA receiving set according to claim 9 in the same case.

[Claim 16] The data communication unit characterized by having the data source according to claim 2 and a data sink according to claim 10 in the same case.

[Claim 17] The data communication unit characterized by having the data source according to claim 6 and a data sink according to claim 12 in the same case.

[Claim 18] The data communication unit characterized by having the data source according to claim 7 and a data sink according to claim 13 in the same case.

[Claim 19] The data communication unit characterized by having the data source according to claim 8 and a data sink according to claim 14 in the same case.

[Claim 20] The data communication approach characterized by being the data communication approach which communicates the coded data which comes to encode the information as which real-time requirement or a time series continuity is required through the communication network with which a transmission band may be changed according to a load profile initiation, and for a data receiving side presuming the transmission band of a communication network, notifying a data source of the transmission control directions based on this, and a data source controlling data transmission based on the above-mentioned transmission control directions.

[Claim 21] The data communication approach characterized by being the data communication approach according to claim 20, and for a data source recording the packet size and the time stump which gives transmitting time of day on each of a transmitting packet, transmitting to it, and a data receiving side presuming a transmission band based on the time stump which gives the packet size and transmitting time of day which are recorded on the receipt time of a data packet, and a data packet.

[Claim 22] It is the data communication approach according to claim 21, and a data receiving side is a packet size n1. The data communication approach characterized by presuming a transmission band S based on a degree type when the transmitting time of day when the transmitting time of day currently recorded on the data packet is recorded on t1A, and the receipt time is recorded on the data packet of t1B and a packet size n2 (n2 !=n1) is given by t2A and the receipt time is given by t2B.

$S=(n2-n1)/\{(t2B-t2A)-(t1B-t1A)\}$

[Claim 23] The data communication approach which is the data communication approach according to claim 21 or 22, and is characterized by for a data source making the redundancy packet in which it is the packet prepared apart from the coding packet obtained from coded data, and the packet size differs from it of a coding packet intermingled, and transmitting.

[Claim 24] The data communication approach which is the data communication approach according to claim 21 or 22, and is characterized by for a data source making the coding packet which differs in a packet size intermingled, and transmitting.

[Claim 25] The data communication approach which is the data communication approach according to claim 20, and is characterized by notifying the coding time stump which requires the dissolution of delay of a data source when the amount of transit delays is presumed and the amount of transit delays exceeds a predetermined threshold from the packet size of the transmission band which the data receiving side presumed, and the actually received data packet.

[Claim 26] Are the data communication approach according to claim 25, and a data source cancels all the coded data and coding packets under current processing, when a coding time stump is notified from a data receiving side. Coding processing and transmission processing are resumed from the coded data newly inputted after that and a coding packet. Record a coding time stump with a notice on the coding packet generated by the beginning after a restart, and it transmits to it. The data communication approach characterized by for a data receiving side supervising reception of a coding packet with the same coding time stump as the above-mentioned coding time stump notified previously, and resuming the usual reception actuation from the coding packet concerned after the confirmation of receipt.

[Claim 27] Are the data communication approach according to claim 20, and when a data receiving side maintains the amount of delay at a predetermined value under the situation of the presumed transmission band, it asks for a required packet size. When the difference of the called-for packet size and the packet size of the actually received data packet exceeds a predetermined threshold, or when those ratios exceed the predetermined range, A data source is notified by making the packet size for which it asked from the presumed transmission band into a coding packet size. The data communication approach characterized by a data source changing into a coding packet size with a notice the packet size of the coding packet sent out after that when a coding packet size is notified from a data receiving side.

[Claim 28] The data communication approach that it asks for the coding parameter which is the data communication approach according to claim 20, and is controlled in the range in which a data receiving side does not exceed the transmission band presumed in the bit rate of the coded data generated in a data source, and a data source is notified of the coding parameter concerned, and a data source is characterized by controlling coding processing based on the coding parameter concerned when a coding parameter is notified from a data receiving side.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the data communication unit (the data source and data sink) which transmits the real-time continuation information on a video signal, a sound signal, and others using packet communication networks, such as LAN. Moreover, it is related with the data communication approach suitable for the communication link using this data communication unit.

[0002]

[Description of the Prior Art] Reference name: When using the communication network (for example, LAN) whose JP,9-321798,A transmission band is not fixed for the communication link of the information required of real-time continuation transmission of a TV phone etc., processing of changing the coding rate of a transmitting side according to the loaded condition of a communication network is needed.

[0003] Conventionally, there are some which are indicated by the above-mentioned reference as this kind of a data communication unit. Drawing 2 is an example of the data communication unit indicated by the above-mentioned reference. The data communication unit of this reference turns into the information sending set 201 and the information receiving set 202 from a communication network 203. Furthermore, the information receiving set 202 includes the transit delay presumption means 204 and the renewal demand means 205 of a coding rate.

[0004] After encoding the dynamic image inputted with the camera etc., the information sending set 201 packet-izes this, and transmits it to a communication network 203. On the other hand, the information receiving set 202 decodes the packet data received through the communication network 203, and outputs them to a television monitor etc. At this time, the transit delay presumption means 204 presumes the amount of transit delays of a communication network 203.

[0005] Here, by the above-mentioned reference, it asks for estimate delta[of the amount of transit delays] t [sec/bit] from the following (1) type using bit rate [of the packet data which the information receiving set 202 received from time of day 0 from time of day t by average bit rate / of the packet data which the information sending set 201 transmitted by time of day T / R [bps], and time-of-day t+T] r [bps].

[0006]

deltat=1/r-1/R -- (1)

However, time of day t is time of day when the data transmitted to time of day 0 from the information sending set 201 reach the information receiving set 202.

[0007] In addition, since the value of the parameter R used for presumption of the amount of transit delays is beforehand notified to the transit delay presumption means 204 from the information sending set 201, the transit delay presumption means 204 calculates estimate deltat by measuring Parameter r to every time interval T.

[0008] Next, the renewal demand means 205 of a coding rate asks for desired value R[of a coding rate]' [bps] by the following (2) formulas, when the difference of estimate deltat of the amount of transit delays and the desired value K of a transit delay is large.

[0009]

R'=r/(1-r-K) -- (2)

This desired value R' is a coding rate required of the information sending set 201 in order to bring the amount of transit delays (correctly that estimate deltat) close to desired value K.

[0010] The information receiving set 202 sends desired value R' of the above-mentioned coding rate to the **** sending set 201 through a communication network 203.

[0011] If this desired value R' is received, the information sending set 201 will control a coding rate so that a transmitting bit rate becomes R'.

[0012] Thus, the technique which rationalizes the load of a communication network in macro is shown to above-mentioned reference by by changing a coding rate so that the amount of transit delays (correctly estimate deltat) may be brought close to desired value K.

[0013]

[Problem(s) to be Solved by the Invention] However, with the equipment of the above-mentioned configuration, since the desired value K of the amount of transit delays is defined beforehand and a coding rate is changed corresponding to this, when the band of a communication network 203 changes dynamically, the load of a communication network 203 is not necessarily rationalized. That is, if the band of a communication network 203 becomes narrower than coding rate desired value R' given by (2) formulas, the information sending set 201 will transmit data superfluously, and a communication network 203 will lapse into a congestion condition.

[0014] For this reason, when the technique concerned was applied to transmission of the real-time continuation information on a video signal, a sound signal, and others, there was a problem from which it becomes difficult to maintain the stable quality.

[0015]

[Means for Solving the Problem] (A) In order to solve this technical problem, in case the coded data which comes to encode the information as which real-time requirement or a time series continuity is required in this invention is communicated through the communication network with which a transmission band may be changed according to a load profile initiation, (1) data receiving side presumes the transmission band of a communication network, and notifies a data source of the transmission control directions based on this, and (2) data sources control data transmission based on transmission control directions. By this control, a transmission band can reflect the fluctuation in communications control also under the situation that it may change dynamically.

(B) Here, in order to enable presumption of a transmission band, (1) data source shall record the packet size and the time stump which gives transmitting time of day on each of a transmitting packet, and shall transmit to it, and (2) data receiving side shall presume a transmission band based on the time stump which gives the packet size and transmitting time of day which are recorded on the receipt time of a data packet, and a data packet.

[0016] In addition, in that case, a data source is the packet prepared apart from the coding packet obtained from coded data, and it is desirable to make the redundancy packet in which the packet size differs from it of a coding packet intermingled, and to transmit. Or it is desirable for a data source to make the coding packet which differs in a packet size intermingled, and to transmit.

(C) Moreover, when the amount of transit delays is presumed and the amount of transit delays exceeds a predetermined threshold as an example of transmission control directions from the packet size of the transmission band which the data receiving side presumed, and the actually received data packet, notify the coding time stump which requires the dissolution of delay of a data source.

[0017] When a coding time stump is notified for a data source from a data receiving side at this time, all the coded data and coding packets under current processing are canceled. Coding processing and transmission processing are resumed from the coded data newly inputted after that and a coding packet. Record a coding time stump with a notice on the coding packet generated by the beginning after a restart, and it transmits to it. Moreover, if a data receiving side supervises reception of a coding packet with the same coding time stump as the above-mentioned coding time stump notified previously and it is made to resume the usual reception actuation from the coding packet concerned after the confirmation of receipt Rationalization of the load given to a communication network with the dissolution of a transit delay is realizable.

(D) Moreover, when a data receiving side maintains the amount of delay at a predetermined value under the situation of the presumed transmission band as an example of transmission control directions, ask for a required packet size. When the difference of the called-for packet size and the packet size of the actually received data packet exceeds a predetermined threshold, or when those ratios exceed the predetermined range, A data source is notified by making the packet size for which it asked from the presumed transmission band into a coding packet size. If a data source changes into a coding packet size with a notice the packet size of the coding packet sent out after that when a coding packet size is notified from a data receiving side A transit delay can be kept constant also when changing the transmission band of a communication network dynamically.

A data receiving side as an example of transmission control directions (E) Moreover, a data receiving side It asks for the coding parameter controlled in the range which does not exceed the transmission band presumed in the bit rate of the coded data generated in a data source. Notify a data source of the coding parameter concerned, and if a data source controls coding processing based on the coding parameter concerned when a coding parameter is notified from a data receiving side Also when changing the transmission band of a communication network dynamically, the load which controls the amount of information generated in a transmitting side, and is applied to a communication network can be optimized.

[0018]

[Embodiment of the Invention] The operation gestalt in the case of using the data communication unit concerning this invention for the communication link of an image (video) signal hereafter is explained.

(A) The functional-block configuration of the video communication device applied to the 1st operation gestalt at the 1st operation gestalt (A-1) equipment configuration drawing 1 is shown. In addition, drawing 1 is a configuration when [expedient] using for explanation of an operation gestalt, and can arrange these functions dispersively to two or more equipments (case) with actual equipment. The same is said of the case of other operation gestalten mentioned later.

[0019] The video communication device concerning the 1st operation gestalt consists of the information sending set 101 and the information receiving set 102 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 101 and the information receiving set 102. Drawing 1 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0020] A video camera 103, the video coding section 104, the coding packet generation section 105, the packet transmitting section 106, and the test packet generation section 107 are formed in the information sending set 101 formed in a transmitting side.

[0021] Here, a video camera 103 is a means for outputting the dynamic-image data which picturized and obtained the real space image to the video coding section 104. In addition, in drawing 1 , although the image pick-up means is used for incorporation of dynamic-image data, the dynamic-image (it reproduced) data read from the storage may be used.

[0022] The video coding section 104 is a means to encode based on the band data given through a communication network from the transmission band presumption section 111 which mentions later the dynamic-image data inputted from a video camera 103. The dynamic-image data after coding are outputted to the coding packet generation section 105 as a coding stream.

[0023] The coding packet generation section 105 is a means to packet-ize the coding stream inputted from the video coding section 104. In addition, the packet-ized coding stream is outputted to the packet transmitting section 106 as a coding packet.

[0024] The test packet generation section 107 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 106. In addition, that in which the magnitude differs from the magnitude of a coding packet is used for a test packet. It mentions later for details.

[0025] The packet transmitting section 106 is a means to send out the coding packet inputted from the coding packet generation section 105, and the test packet inputted from the test packet generation section 107 to a communication network. In addition, the sent-out data packet is transmitted to the information receiving set 102 through a communication network.

[0026] On the other hand, the packet receive section 108, the video decode section 109, a monitor 110, and the transmission band presumption section 111 are formed in the information receiving set 102 formed in a receiving side.

[0027] Here, the packet receive section 108 is a means to input a data packet from a communication network. The packet receive section 108 outputs a coding packet to the video decode section 109 among the received data packets, and outputs a packet header to the transmission band presumption section 111.

[0028] The video decode section 109 is a means to input a coding packet and to decode from the packet receive section 108 to dynamic-image data. In addition, the decoded dynamic-image data are outputted to a monitor 110.

[0029] A monitor 110 is a means to display the dynamic-image data inputted from the video decode section 109.

[0030] The transmission band presumption section 111 is a means to presume the band of the communication network which changes serially using a packet header, and to output to a transmitting side by using a presumed result as band data.

(A-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(A-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 103. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 104 from a video camera 103.

[0031] The video coding section 104 encodes the inputted dynamic-image data based on band data, and outputs a corresponding coding stream. Here, band data are given from the transmission band presumption section 111 of a receiving side. Band data are a value showing the transmission band of the communication network at the time of transmitting a data packet from the information sending set 101 to the information receiving set 102.

[0032] The video coding section 104 controls a frame rate and image quality so that the bit rate of a coding stream does not exceed a transmission band. This control is realized by the predetermined parameter (a frame rate and image quality control parameter). Of course, it is also possible to calculate this parameter based on the value of the received band data each time, and to ask it for it. However, with this operation gestalt, it shall encode with reference to one of these tables based on the value of the band data with which two or more correspondence tables which defined the relation between the value of band data and a parameter (a frame rate and image quality control parameter) should be beforehand prepared, and the video coding section 104 was given.

[0033] The correspondence table referred to is chosen according to liking (image quality priority, motion priority, etc.) of the user of the information sending set 101. In addition, a predetermined default is used for the period as which band data are not inputted from the transmission band presumption section 111 at the time of initiation of operation as band data. This default is set up in accordance with a demand of for example, an equipment user.

[0034] The encoded dynamic-image data are given to the coding packet generation section 105 as a coding stream. The coding packet generation section 105 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 106 as a coding packet. Although well-known technique may be conventionally used for the approach of division of a packet, it is divided with this operation gestalt so that it may become the magnitude of the immobilization which defined the coding stream beforehand.

[0035] Drawing 3 is the example of a configuration of a data packet. 301 express the configuration of a coding packet among drawing. It consists of a time stump TS (303 in drawing), a packet size PS (304 in drawing) and sequence number SE (305 in drawing), and frame status STAT (306 in drawing), and data DAT A (307 in drawing), the inside 302-306 of drawing corresponds to a packet header, and a coding packet corresponds to the coding stream by which 307 was divided. [a packet class flag (302 in drawing) with the fixed value 0,]

[0036] In case the coding packet generation section 105 prepares a packet header, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 101, sets a packet size PS based on the magnitude of a coding packet, sets a sequence number SEQ based on the identification number of the coding packet under processing, and sets the frame status STAT based on the positional information on the dynamic-image frame to which the coding packet under processing corresponds (a frame start, the center of a frame, frame termination, etc.).

[0037] Next, the packet transmitting section 106 will transmit to the packet receive section 108 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 105. In addition, the packet transmitting section 106 requires a test packet of the test packet generation section 107 as the N+1st packets.

[0038] If the demand of a test packet is received from the packet transmitting section 106, the test packet generation section 107 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 106.

[0039] 308 of drawing 3 expresses the configuration of a test packet. A test packet consists of a packet class flag (309 in drawing) with the fixed value 1, and a packet size PS (311 in drawing) and a test data TEST (312 in drawing), and the inside 309-311 of a Fig. corresponds to a packet header inside. [a time stump TS (310 in drawing), and]

[0040] In case the test packet generation section 107 prepares a test packet, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 101, sets a packet size PS based on the magnitude of a test packet, and sets the test data TEST of arbitration.

[0041] The packet transmitting section 106 will transmit to the packet receive section 108 by making this into a data packet, if a test packet is inputted from the test packet generation section 107. Then, whenever the packet transmitting section 106 transmits the coding packet of N individual to the packet receive section 108, it transmits one test packet to the packet receive section 108, and repeats these processings.

[0042] As mentioned above, the information sending set 101 in this operation gestalt receives the notice of the transmission band of a communication network from the information receiving set 102, and performs coding control according to this while it transmits a coding packet and a test packet to the information receiving set 102.

(A-2-2) If the packet receive section 108 of a receiving side of operation receives a data packet from the packet transmitting section 106, based on the packet class flag of a packet header, this packet will judge a coding packet or a test packet.

[0043] The packet receive section 108 outputs the packet header taken out from the data packet to the transmission band presumption section 111 while outputting this to the video decode section 109, if a coding packet is detected.

[0044] If a coding packet is inputted from the packet receive section 108, the video decode section 109 will take out data DAT A corresponding to the divided coding stream based on the packet size PS of a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0045] Moreover, if it judges that the video decode section 109 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 110.

[0046] A monitor 110 will display this on display DEPAISU, such as a CRT display, if dynamic-image data are inputted from the video decode section 109.

[0047] On the other hand, the transmission band presumption section 111 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 108, and transmits to it by making this into band data at the video coding section 104.

[0048] Drawing 4 is a flow chart which shows the procedure of the transmission band presumption section 111. If a packet header is first received at step S401, the transmission band presumption section 111 will be the following step S402, and will judge whether it is a test packet header or it is a coding packet header.

[0049] When a test packet header is detected at step S402, the transmission band presumption section 111 progresses to step S404. At step S404, the transmission band presumption section 111 takes out a time stump TS and a packet size PS from a packet header, and is parameter t1A and n1, respectively. It stores. Furthermore, the transmission band presumption section 111 measures the present time of day using the internal clock of the information receiving set 102, stores this in parameter t1B, and returns to step S401.

[0050] On the other hand, when a coding packet header is detected at step S402, the transmission band presumption section 111 progresses to step S403. At step S403, the transmission band presumption section 111 takes out a time stump TS and a packet size PS from a packet header, and is parameter t2A and n2, respectively. It stores. Furthermore, the transmission band presumption section 111 measures the present time of day using the internal clock of the information receiving set 102, stores this in parameter t2B, and progresses to step S405.

[0051] The transmission band presumption section 111 which progressed to step S405 judges whether a test packet is effective. That is, when step S404 is not once performed after processing initiation of the transmission band presumption section 111, the transmission band presumption section 111 judges that a test packet is invalid, and returns to step S404. On the other hand, in other than the above, the transmission band presumption section 111 judges that a test packet is effective, and progresses to step S406. If it progresses, based on the following (3) types, the transmission band presumption section 111 presumes the transmission band S of a communication network, and when [which is step S406] a presumed result is obtained, it will progress to step S407.

[0052]

$S=(n2-n1)/\{(t2B-t2A)-(t1B-t1A)\}$ -- (3)

If the transmission band presumption section 111 progresses to the following step S407, it will transmit the presumed band data S to the video coding section 104, and will return to step S401 again.

[0053] Here, the semantics of above-mentioned (3) types is explained. Since the information sending set 101 and the information receiving set 102 are isolated systems connected through the communication network, they have an internal clock different, respectively. Then, the time difference of both internal clock is set to T. the time of day when a packet will be transmitted with the information sending set 101 if a test packet is observed -- t1B and its magnitude -- n1 it is . the time of day when the same packet is received with the information receiving set 102 on the other hand -- t1B -- it is -- the magnitude -- n2 it is .

[0054] It is n1 when the transmission band of a communication network is S [bps]. The transit delay to the packet of [bit] is given by n1 / S [sec], and the following (4) types are realized.

[0055]

$t1B-t1A=n1/S+T$ -- (4)

If it asks for the same relation paying attention to a coding packet, the following (5) types will be realized.

[0056]

$t2B-t2A=n2/S+T$ -- (5)

From above-mentioned (4) types and (5) types, elimination of the time difference T of an internal clock materializes above-mentioned (3) types. Therefore, (3) types will give estimate appropriate as a transmission band of a communication network.

[0057] In addition, after inputting two or more test packet headers and coding packet headers, you may make it have explained by drawing 4 , as what presumes the band data S and transmits to the video coding section 104, whenever actuation of the transmission band presumption section 111 was inputted into the coding packet header, but ask for the equalized band data S, in order to reduce the effect of partial fluctuation of a transmission band.

[0058] As mentioned above, the information receiving set 102 concerning this operation gestalt decodes a coding packet, and reproduces and displays dynamic-image data. In addition, the information receiving set 102 presumes the transmission band S of a communication network based on the time stump and packet size at the time of transmission and reception of a coding packet and a test packet, and notifies this to the information sending set 101 which is a transmitting side.

(A-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 101 in a transmitting side sends out, transmit, and the information receiving set 102 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. And the load of a communication network can be rationalized, without lapsing into a congestion condition, even when the information receiving set 102 which presumed the transmission band S notifies the information to the information sending set 101, the information sending set 101 can control appropriately the informational quality and the informational amount of signs to send out and a transmission band S changes dynamically.

[0059] In this way, also when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality. And it is the information sending set 101, and since coding actuation is controlled, an intention of the user of the information sending set 101 can be made to reflect in the quality of the information to transmit in this operation gestalt.

(B) The functional-block configuration of the video communication device applied to the 2nd operation gestalt at the 2nd operation gestalt (B-1) equipment configuration drawing 5 is shown.

[0060] Also about the video communication device concerning the 2nd operation gestalt, the basic configuration is the same as that of the 1st operation gestalt, and consists of the information sending set 501 and the information receiving set 502 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 501 and the information receiving set 502. Drawing 5 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0061] A video camera 503, the video coding section 504, the coding packet generation section 505, the packet transmitting section 506, and the test packet generation section 507 are formed in the information sending set 501 formed in a transmitting side.

[0062] Here, a video camera 503 and the video camera 103 of the 1st operation gestalt are the same equipment. That is, a video camera 503 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 504. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 503 but from the storage.

[0063] The video coding section 504 is a means to encode the dynamic-image data inputted from a video camera 503, and to output to the coding packet generation section 505 by making the dynamic-image data after coding into a coding stream.

[0064] In addition, when a coding time stump is inputted through a communication network from the delay dissolution demand section 512 mentioned later, the video coding section 504 outputs the coding time stump which stopped the coding processing to a current frame and was received to the latter part, and when a new frame is given from a video camera 503 after that, it resumes coding processing.

[0065] The coding packet generation section 505 is a means to packet-ize the coding stream or coding time stump inputted from the video coding section 504. The packet-ized data are outputted to the packet transmitting section 506 as a coding packet. In addition, when a coding time stump is inputted, the coding packet generation section 505 sets an internal clock by the value of a coding time stump while discarding all the coding streams that remain inside at the time.

[0066] The test packet generation section 507 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 106. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0067] The packet transmitting section 506 is a means to send out the coding packet inputted from the coding packet generation section 505, and the test packet inputted from the test packet generation section 107 to a communication network. In addition, when inputted from the delay dissolution demand section 512 which a coding time stump mentions later, the packet transmitting section 506 discards all the packets that remain at the time, and it interrupts transmitting processing of data temporarily until the time stump given to the packet newly inputted after that is in agreement with a coding time stump.

[0068] On the other hand, the packet receive section 508, the video decode section 509, a monitor 510, the transmission band presumption section 511, and the delay dissolution demand section 512 are formed in the information receiving set 502 formed in a receiving side.

[0069] Here, the packet receive section 508 is a means to input a data packet from a communication network. The packet receive section 508 outputs a coding packet to the video decode section 509 among the received data packets, and outputs a packet header to the transmission band presumption section 511. In addition, the packet receive section 508 makes a processing object only what has a time stump newer than a coding time stump among the data packets which discard all the coding packets that remain inside and arrive after that at the time, when a coding time stump is inputted from the delay dissolution demand section 512.

[0070] The video decode section 509 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 508. In addition, the decoded dynamic-image data are outputted to a monitor 510.

[0071] A monitor 510 is a means to display the dynamic-image data inputted from the video decode section 509.

[0072] The transmission band presumption section 511 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the packet header used for the presumed band data and its presumption is outputted to the delay dissolution demand section 512.

[0073] The delay dissolution demand section 512 presumes a transit delay using the band data and the packet header which are given from the transmission band presumption section 511, and when a presumed result is excessive, it is a means to aim at the dissolution. When a presumed result is larger than a predetermined threshold, specifically, a coding time stump is outputted to a transmitting side.

(B-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(B-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 503. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 504 from a video camera 503.

[0074} Unless the coding time stump is inputted from the delay dissolution demand section 512, the video coding section 504 encodes the inputted dynamic-image data, and outputs a corresponding coding stream. On the other hand, when a coding time stump is inputted from the delay dissolution demand section 512, the video coding section 504 stops the coding processing of a dynamic-image frame which was being performed till then, replaces it with a coding stream, and outputs a coding time stump. In addition, the video coding section 504 outputs after the output of this coding time stump as a coding stream which inputs the following data of a new dynamic-image frame, encodes this, and corresponds from a video camera 503.

[0075] If a coding stream is inputted from the video coding section 504, like the coding packet generation section 105 explained with the 1st operation gestalt, the coding packet generation section 505 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 506 as a coding packet. In addition, also in this operation gestalt, with this operation gestalt, although well-known technique may be conventionally used for the approach of division of a packet, it divides so that it may become the magnitude of the immobilization which defined the coding stream beforehand.

[0076] Moreover, if a coding time stump is inputted from the video coding section 504, the coding packet generation section 505 will cancel all the data of the coding stream which remains in the interior, and it will operate so that the internal clock of the information sending set 501 may be set by the value of a coding time stump. The coding packet generation section 505 sets this value to coincidence as a time stump TS in a packet header.

[0077] Next, the packet transmitting section 506 will transmit to the packet receive section 508 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 505.

[0078] However, the packet transmitting section 506 cancels all the data of the coding packet which remains in the interior, when a coding time stump is inputted from the delay dissolution demand section 512. Then, the packet transmitting section 506 supervises the packet header of the coding packet more newly than the coding packet generation section 505 inputted, and it does not transmit a data packet until the value of the time stump TS given to this is in agreement with the value of the above-mentioned coding time stump. Then, the packet transmitting section 506 transmits to the packet receive section 508 by making a coding packet into a data packet again.

[0079] In addition, if the packet transmitting section 506 transmits to the packet receive section 508 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 507 as the N+1st packets.

[0080] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 506, the test packet generation section 507 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 506.

[0081] The packet transmitting section 506 will transmit to the packet receive section 508 by making this into a data packet, if a test packet is inputted from the test packet generation section 507. Then, whenever the packet transmitting section 506 transmits the coding packet of N individual to the packet receive section 508, it transmits one test packet to the packet receive section 508, and repeats these processings.

[0082] As mentioned above, although the information sending set 501 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 502 to predetermined timing When it differs in the information sending set 101 concerning the 1st operation gestalt and a coding time stump is received from the delay dissolution demand section 512 in the information receiving set 502 Are in the information sending set 501 and all of the coding stream which is not transmitted to the information receiving set 502 yet and a coding packet are canceled. What gave the above-mentioned coding time stump to the packet header of the data packet which packet-ized the newest dynamic-image data is transmitted to the information receiving set 502.

(B-2-2) If the packet receive section 508 of a receiving side of operation receives a data packet from the packet transmitting section 506 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0083] The packet receive section 508 outputs the packet header taken out from the data packet to the transmission band presumption section 251 while outputting this to the video decode section 509, if a coding packet is detected.

[0084] However, when a coding time stump is inputted from the delay dissolution demand section 512, the packet receive section 508 cancels all the coding packets that remain in the interior, and does not perform any output to a data packet with the time stump TS older than the above-mentioned coding time stump in a packet header.

[0085] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 508, the video decode section 509 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0086] Moreover, if it judges that the video decode section 509 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 510.

[0087] A monitor 510 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 509.

[0088] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 511 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 508, and transmits to it by making this into band data at the delay dissolution demand section 512. Here, the transmission band presumption section 511 presumes a transmission band based on above-mentioned (3) types. In addition, the transmission band presumption section 511 outputs a packet header to the delay dissolution demand section 512 with the band data concerned.

[0089] The delay dissolution demand section 512 will presume the transit delay of a communication network, if band data and a packet header are inputted from the transmission band presumption section 511. Here, the delay dissolution demand section 512 calculates a transit delay D [sec] based on the following (6) types using the packet size PS [bit] in band data S [bps] and a packet header.

[0090]

$D=PS/S$ -- (6)

If a transit delay D can be found by count in this way, when the transit delay D concerned judges whether it is larger than a predetermined threshold and it judges that it is large, the delay dissolution demand section 512 will judge that it is necessary to cancel delay of a communication network, and will output a coding time stump. This coding time stump is outputted to the video coding section 504, the packet transmitting section 506, and the packet receive section 508. In other than the above, no delay dissolution demand sections 512 are outputted.

[0091] In addition, what is necessary is just to define the above-mentioned predetermined threshold according to the application and specification of a system. With this operation gestalt, 2 seconds is set up as threshold value of the transit delay at which the real-time communication link to the information receiving set 502 from the information sending set 501 is maintained, for example.

[0092] Incidentally, the above-mentioned coding time stump is the time stump TS of the packet header given to the data packet of the beginning after canceling delay of a communication network, and the delay dissolution demand section 512 determines the value TS 2 of a coding time stump using the following (7) types.

[0093]

$TS2=TS1+D+C$ -- (7)

However, TS1 is the time stump TS in the packet header inputted from the transmission band presumption section 511. Moreover, D is a transit delay given by (6) formulas, and C is a forward predetermined constant. (7) Set the coding time stump received with the information sending set 501 by setting the value of C as a suitable value in a formula as a value newer than the time stump of which data packet currently processed within the information sending set 501.

[0094] As mentioned above, although the information receiving set 502 concerning this operation gestalt operates so that a coding packet may be decoded and dynamic-image data may be reproduced and displayed, they differ in the information receiving set 102 of the 1st operation gestalt, and presume the transit delay of a communication network further after presuming a transmission band from the information on the packet header of a coding packet and a test packet.

[0095] And when the transit delay is what needs a dissolution, while transmitting a coding time stump to the information sending set 501, actuation which resumes decode actuation from the coding packet to which the above-mentioned coding time stump which is in the information receiving set 502, cancels all the coding packets that are not decoded yet, and comes after that was given is performed.

(B-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 501 in a transmitting side sends out, transmit, and the information receiving set 502 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 502 determines the timing which cancels a transit delay D based on this transmission band S, and notifies this to the information sending set 501.

[0096] Thereby, the information sending set 501 cancels an internal unnecessary buffer, and newly starts coding. On the other hand, if a transit delay dissolution is determined, the information receiving set 502 will cancel an internal unnecessary buffer, and will decode only the coding packet processed with the information sending set 501 after the signal of a transit delay dissolution.

[0097] Therefore, also when [of the case where a transit delay increases when the transmission band of a communication network changes dynamically, the information sending set 501, or the information receiving set 502] a transit delay increases more deficient in performance, a transit delay can be canceled and the load of a communication network can be rationalized.

[0098] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

(C) The functional-block configuration of the video communication device applied to the 3rd operation gestalt at the 3rd operation gestalt (C-1) equipment configuration drawing 6 is shown.

[0099] Also about the video communication device concerning the 3rd operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 601 and the information receiving set 602 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 601 and the information receiving set 602. Drawing 6 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0100] A video camera 603, the video coding section 604, the coding packet generation section 605, the packet transmitting section 606, and the test packet generation section 607 are formed in the information sending set 601 formed in a transmitting side.

[0101] The video camera 603 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 603 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 604. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 603 but from the storage.

[0102] The video coding section 604 is a means to encode the dynamic-image data inputted from a video camera 601, and to output to the coding packet generation section 605 by making the dynamic-image data after coding into a coding stream.

[0103] The coding packet generation section 605 is a means to packet-ize the coding stream inputted from the video coding section 604. In the case of this packet-izing, the coding packet generation section 605 is given through a communication network from the packet size demand section 612 mentioned later, and uses a ****** coding packet size. The packet-ized data are outputted to the packet transmitting section 606 as a coding packet.

[0104] The test packet generation section 607 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 606. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0105] The packet transmitting section 606 is a means to output the coding packet inputted from the coding packet generation section 605, and the test packet inputted from the test packet generation section 607 to a communication network.

[0106] On the other hand, the packet receive section 608, the video decode section 609, a monitor 610, the transmission band presumption section 611, and the packet size demand section 612 are formed in the information receiving set 602 formed in a receiving side.

[0107] Here, the packet receive section 608 is a means to input a data packet from a communication network. The packet receive section 608 outputs a coding packet to the video decode section 609 among the received data packets, and outputs a packet header to the transmission band presumption section 611.

[0108] The video decode section 609 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 608. In addition, the decoded dynamic-image data are outputted to a monitor 610.

[0109] A monitor 610 is a means to display the dynamic-image data inputted from the video decode section 609.

[0110] The transmission band presumption section 611 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the packet header used for the presumed band data and its presumption is outputted to the packet size demand section 612.

[0111] The packet size demand section 612 is a means to compute the coding packet size suitable for a current communication link situation using the band data and the packet header which are given from the transmission band presumption section 611. In addition, the computed coding packet size is outputted to a transmitting side.

(C-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(C-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 603. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 604 from a video camera 603.

[0112] Next, dynamic-image data will be encoded and the video coding section 604 will output a corresponding coding stream, if dynamic-image data are inputted from a video camera 603.

[0113] If a coding stream is inputted from the video coding section 604, like the coding packet generation section 605 explained with the 1st operation gestalt, the coding packet generation section 605 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 606 as a coding packet.

[0114] However, if a coding packet size is inputted from the packet size demand section 612, the coding packet generation section 605 will change into the same value as the above-mentioned coding packet size the packet size which gives a division unit, and will divide a coding stream using this value henceforth.

[0115] Like the packet transmitting section 106 of the 1st operation gestalt, the packet transmitting section 606 will transmit to the packet receive section 608 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 605.

[0116] However, if the packet transmitting section 606 transmits to the packet receive section 608 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 607 as the N+1st packets.

[0117] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 606, the test packet generation section 607 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 606.

[0118] The packet transmitting section 606 will transmit to the packet receive section 608 by making this into a data packet, if a test packet is inputted from the test packet generation section 607. Then, whenever the packet transmitting section 606 transmits the coding packet of N individual to the packet receive section 608, it transmits one test packet to the packet receive section 608, and repeats these processings.

[0119] As mentioned above, although the information sending set 601 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 602, in the information sending set 101 concerning the 1st operation gestalt, they differ and update the magnitude of the coding packet which transmits according to directions of the information receiving set 602.

(C-2-2) If the packet receive section 608 of a receiving side of operation receives a data packet from the packet transmitting section 606 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0120] The packet receive section 608 outputs the packet header taken out from the data packet to the transmission band presumption section 611 while outputting this to the video decode section 609, if a coding packet is detected.

[0121] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 608, the video decode section 609 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0122] Moreover, if it judges that the video decode section 609 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 610.

[0123] A monitor 610 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 609.

[0124] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 611 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 608, and outputs it to it by making this into band data at the packet size demand section 612. Here, the transmission band presumption section 611 presumes a transmission band based on above-mentioned (3) types. In addition, the transmission band presumption section 611 outputs a packet header to the packet size demand section 612 with the band data concerned.

[0125] The packet size demand section 612 will calculate the value PS of the coding packet size to which the information sending set 601 was suitable for using for division of a coding packet [bit] based on the following (8) types using band data S [bps] and a transit delay D [sec], if band data and a packet header are inputted from the transmission band presumption section 611.

PS=SxD -- (8)

Here, the transit delay D used for count shall be a fixed value chosen from within the limits of the transit delay required of a system, for example, the user of a system shall set it up beforehand.

[0126] If the coding packet size PS can be found by count in this way, the packet size demand section 612 will transmit the coding packet size PS which was able to be found by (8) types in the value of the coding packet size PS concerned when both difference was larger than a predetermined threshold, or when predetermined was out of range as compared with the value of the packet size in a packet header as for both ratio to the coding packet generation section 605.

[0127] Consequently, when the magnitude of the coding packet used with the information sending set 601 is changed into the coding packet size PS, to the communication network of a transmission band S, a transit delay D will be given by D=PS/S and a fixed transit delay will be maintained.

[0128] As mentioned above, although the information receiving set 602 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, they differ in the information receiving set 102 of the 1st operation gestalt, calculate the packet size PS for making a transit delay D fixed-ize using the transmission band S of the communication network presumed from the information on the packet header of a coding packet and a test packet, and performs actuation notified to the information sending set 601.

(C-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 601 in a transmitting side sends out, transmit, and the information receiving set 602 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 602 determines the packet size PS for making a transit delay D fixed-ize using this transmission band S, and notifies this to the information sending set 601.

[0129] The size of the data packet outputted by this from the information sending set 601 which is a transmitting side can be changed into the packet size demanded by the receiving side, and it is maintained by the value always stabilized in the transit delay of a communication network.

[0130] Therefore, also when the transmission band of a communication network changes dynamically and a transit delay fluctuates, a transit delay can be kept constant and the load of a communication network can be rationalized.

[0131] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

(D) The functional-block configuration of the video communication device applied to the 4th operation gestalt at the 4th operation gestalt (D-1) equipment configuration drawing 7 is shown.

[0132] Also about the video communication device concerning the 4th operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 701 and the information receiving set 702 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 701 and the information receiving set 702. Drawing 7 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0133] A video camera 703, the video coding section 704, the coding packet generation section 705, the packet transmitting section 706, and the test packet generation section 707 are formed in the information sending set 701 formed in a transmitting side.

[0134] The video camera 703 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 703 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 704. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 703 but from the storage.

[0135] The video coding section 704 is a means to encode the dynamic-image data inputted from a video camera 701. The video coding section 704 uses the coding parameter given through a communication network from the coding parameter demand section 712 mentioned later in the case of this coding. The encoded dynamic-image data are outputted to the coding packet generation section 705 as a coding stream.

[0136] The coding packet generation section 705 is a means to packet-ize the coding stream inputted from the video coding section 704.

[0137] The test packet generation section 707 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 706. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0138] The packet transmitting section 706 is a means to output the coding packet inputted from the coding packet generation section 705, and the test packet inputted from the test packet generation section 707 to a communication network.

[0139] On the other hand, the packet receive section 708, the video decode section 709, a monitor 710, the transmission band presumption section 711, and the coding parameter demand section 712 are formed in the information receiving set 702 formed in a receiving side.

[0140] Here, the packet receive section 708 is a means to input a data packet from a communication network. The packet receive section 708 outputs a coding packet to the video decode section 709 among the received data packets, and outputs a packet header to the transmission band presumption section 711.

[0141] The video decode section 709 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 708. In addition, the decoded dynamic-image data are outputted to a monitor 710.

[0142] A monitor 710 is a means to display the dynamic-image data inputted from the video decode section 709.

[0143] The transmission band presumption section 711 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the presumed band data are outputted to the coding parameter demand section 712.

[0144] The coding parameter demand section 712 is a means to determine a coding parameter using the band data given from the transmission band presumption section 711. Here, the coding parameter demand section 712 determines a coding parameter that the bit rate of the coding stream generated in a transmitting side will not exceed a current transmission band. In addition, the determined coding parameter is outputted to a transmitting side.

(D-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(D-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 703. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 704 from a video camera 603.

[0145] Next, if dynamic-image data are inputted from a video camera 703, based on the coding parameter inputted from the coding parameter demand section 712, the video coding section 704 will encode dynamic-image data, and will output a corresponding coding stream.

[0146] The above-mentioned coding parameter is a parameter which controls the amount of signs, and playback quality like a frame rate or image quality control parameters (image resolution, quantization step, etc.), and the video coding section 704 encodes dynamic-image data by the well-known approach using these coding parameter conventionally.

[0147] In addition, in periods when a coding parameter is not inputted from the coding parameter demand section 712, such as the time of initiation of operation, a predetermined default is used as a coding parameter. What was set up in accordance with the demand of for example, an equipment user is used for this default.

[0148] Like the coding packet generation section 105 concerning the 1st operation gestalt, if a coding stream is inputted from the video coding section 104, the coding packet generation section 705 will divide this into a packet, will attach a packet header for every packet, and will output it to the packet transmitting section 706 as a coding packet.

[0149] Like the packet transmitting section 106 in the 1st operation gestalt, the packet transmitting section 706 will transmit to the packet receive section 708 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 705.

[0150] It is **, and if the packet transmitting section 706 transmits to the packet receive section 708 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 707 as the N+1st packets.

[0151] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 706, the test packet generation section 707 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 706.

[0152] The packet transmitting section 706 will transmit to the packet receive section 708 by making this into a data packet, if a test packet is inputted from the test packet generation section 707. Then, whenever the packet transmitting section 706 transmits the coding packet of N individual to the packet receive section 708, it transmits one test packet to the packet receive section 708, and repeats these processings.

[0153] As mentioned above, although the information sending set 701 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 702, they differ in the information sending set 101 concerning the 1st operation gestalt, and is made to control coding based on the coding parameter notified from the information receiving set 702.

(D-2-2) If the packet receive section 708 of a receiving side of operation receives a data packet from the bucket transmitting section 706 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0154] The packet receive section 708 outputs the packet header taken out from the data packet to the transmission band presumption section 711 while outputting this to the video decode section 709, if a coding packet is detected.

[0155] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 708, the video decode section 709 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0156] Moreover, if it judges that the video decode section 709 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 710.

[0157] A monitor 710 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 709.

[0158] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 711 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 708, and outputs it to it by making this into band data at the coding parameter demand section 712. Here, the transmission band presumption section 611 presumes a transmission band based on above-mentioned (3) types.

[0159] The coding parameter demand section 712 will calculate the coding parameter which the information sending set 701 uses for coding control, if band data are inputted from the transmission band presumption section 711. At this time, the coding parameter demand section 712 determines coding parameters, such as a frame rate and an image quality control parameter, that the bit rate of the coding stream in the information sending set 701 will not exceed a transmission band.

[0160] In the case of this operation gestalt, two or more preparation of the correspondence table on which the value of a coding control parameter is determined as the coding parameter demand section 712 by the meaning according to the value of band data shall be carried out. In this case, the coding parameter demand section 712 determines a coding parameter by referring to one of these tables. The correspondence table referred to is chosen according to liking (image quality priority, motion priority, etc.) of the user of the information receiving set 702.

[0161] Next, the coding parameter demand section 712 notifies this coding parameter to the video coding section 704, when it differs from the result which the calculated coding parameter calculated last time.

[0162] As mentioned above, although the information receiving set 702 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, unlike the information receiving set 102 in the 1st operation gestalt, it searches the optimal coding parameter using the transmission band S of the communication network presumed from the information on the packet header of a coding packet and a test packet (or count), and it operates so that it may notify to the information sending set 701.

(D-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 701 in a transmitting side sends out, transmit, and the information receiving set 702 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 702 determines the coding parameter for controlling informational quality and the informational amount of signs using this transmission band S, and notifies this to the information sending set 601.

[0163] Thereby, the information sending set 701 can always control coding processing appropriately, and it can rationalize the load of a communication network, without lapsing into a congestion condition, even when a transmission band changes dynamically.

[0164] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

[0165] Moreover, since the information receiving set 702 controls coding unlike the 1st operation gestalt, an intention of the user of the information receiving set 702 can be made to reflect in informational quality according to this operation gestalt.

(E) The functional-block configuration of the video communication device applied to the 5th operation gestalt at the 5th operation gestalt (E-1) equipment configuration drawing 8 is shown.

[0166] Also about the video communication device concerning the 5th operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 801 and the information receiving set 802 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 801 and the information receiving set 802. Drawing 8 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0167] A video camera 803, the video coding section 804, the packet transmitting section 806, and the packet size control section 807 are formed in the information sending set 801 formed in a transmitting side.

[0168] The video camera 803 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 803 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 804. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 703 but from the storage.

[0169] The video coding section 804 is also the equipment with the same video coding section 104 of the 1st operation gestalt. That is, the video coding section 804 encodes based on band data through a communication network from the transmission band presumption section 811 which mentions later the dynamic-image data inputted from a video camera 801. The dynamic-image data after coding are outputted to the packet transmitting section 806 as a coding stream.

[0170] The packet size control section 807 is a means to give a coding packet size to the packet transmitting section 806.

[0171] The packet transmitting section 806 is a means to divide the coding stream inputted from the video coding section 804 the whole coding packet size to which it is given from the packet size control section 807, to packet-ize it, and to send out to a communication network. In addition, the sent-out data packet is transmitted to the information receiving set 802 through a communication network.

[0172] On the other hand, the packet receive section 808, the video decode section 809, a monitor 810, and the transmission band presumption section 811 are formed in the information receiving set 802.

[0173] Here, the packet receive section 808 is a means to input a data packet from a communication network. The packet receive section 808 outputs a coding packet to the video decode section 809 among the received data packets, and outputs a packet header to the transmission band presumption section 811.

[0174] The video decode section 809 is a means to input a coding packet and to decode from the packet receive section 808 to dynamic-image data. In addition, the decoded dynamic-image data are outputted to a monitor 810.

[0175] A monitor 810 is a means to display the dynamic-image data inputted from the video decode section 809.

[0176] The transmission band presumption section 811 is the same equipment as the transmission band presumption section 111 of the 1st operation gestalt. Namely, the transmission band presumption section 811 presumes the band of the communication network which changes serially using a packet header, and outputs it to a transmitting side by using a presumed result as band data.

(D-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(D-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 803. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 804 from a video camera 803.

[0177] The video coding section 804 encodes the inputted dynamic-image data like the video coding section 104 of the 1st operation gestalt based on band data, and outputs a corresponding coding stream. Here, band data are given from the transmission band presumption section 811 of a receiving side.

[0178] If a coding stream is inputted from the video coding section 804, the packet transmitting section 806 will divide a coding stream based on the value of the coding bucket size inputted from the packet size control section 807 mentioned later, and will create a packet. Furthermore, the packet transmitting section 806 attaches attached data (packet header) for every packet, and creates a coding packet.

[0179] Drawing 9 is drawing showing the example of a configuration of a coding packet, and 901 in drawing expresses the configuration of a coding packet. It consists of the frame status STAT (906 in drawing), and time stump TS (903 in drawing), packet size PS (904 in drawing) and sequence number SEQ (905 in drawing), and data DAT A (907 in drawing), the inside 903-906 of drawing corresponds to a packet header, and a coding packet corresponds to the coding stream by which 907 was divided.

[0180] In case the packet transmitting section 806 prepares a packet header, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 801, sets a packet size PS based on the magnitude of a coding packet, sets a sequence number SEQ based on the identification number of the coding packet under processing, and sets the frame status STAT based on the positional information on the dynamic-image frame to which the coding packet under processing corresponds (a frame start, the center of a frame, frame termination, etc.).

[0181] Next, the packet transmitting section 806 transmits to the packet receive section 808 by making a coding packet into a data packet.

[0182] On the other hand, the packet size control section 807 outputs these two coding packet sizes to the packet transmitting section 806 by turns, whenever it prepares two coding packet sizes and the packet transmitting section 806 prepares a coding packet.

[0183] As the two above-mentioned coding packet sizes, it is possible to use any value. However, it is the average band of the communication network used as the example with this operation gestalt S0 It is the maximum of the transit delay in which [bps] and permission are possible D0 It gives by [sec] and is S0 xD0 to a **** case. Two of the values given by the value and S0 xD0 which are given by [bit] / 2 [bit] shall be used.

[0184] As mentioned above, the information sending set 801 in this operation gestalt receives the notice of the transmission band of a communication network from the information receiving set 802, and performs coding control according to this while it transmits a coding packet with two kinds of magnitude to the information receiving set 802 by turns.

(D-2-2) The packet receive section 808 of a receiving side of operation will output to the video decode section 809 by making this into a coding packet, if a data packet is received from the packet transmitting section 806. Moreover, the packet receive section 808 outputs the packet header taken out from the data packet to the transmission band presumption section 811.

[0185] Like the video decode section 109 of the 1st operation gestalt, if a coding packet is inputted from the packet receive section 808, the video decode section 809 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0186] Moreover, if it judges that the video decode section 809 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 810.

[0187] A monitor 810 will display this on display devices, such as a CTR display, if dynamic-image data are inputted from the video decode section 809.

[0188] On the other hand, the transmission band presumption section 811 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 808, and transmits to it by making this into band data at the video coding section 804.

[0189] Drawing 10 is a flow chart which shows the procedure of the transmission band presumption section 811. When a packet header is first received at step S1001, the transmission band presumption section 811 is the following step S1002, takes out a time stump TS and a packet size PS from a packet header, and is parameter t2A and n2, respectively. It stores. Furthermore, the transmission band presumption section 811 measures the present time of day using the internal clock of the information receiving set 802, stores this in parameter t2B, and progresses to step S1003.

[0190] Next, the transmission band presumption section 811 judges whether the last packet is effective in step S1003. That is, when step S1006 is not once performed yet after processing initiation of the transmission band presumption section 811, it judges that the last packet is invalid and progresses to step S1006.

[0191] At step S1006, the transmission band presumption section 811 copies a parameter (t2A, t2B, and N2) to a parameter (t1 A, t1 B and N1), and returns to step S1001.

[0192] On the other hand, in a snap S1003, when it judges that the last packet is effective, the transmission band presumption section 811 progresses to the following step S1004. At step S1004, the transmission band presumption section 811 presumes the transmission band S of a communication network based on (3) types, and progresses to step S1005. The above-mentioned (3) equation will be the same as the formula of a transmission band used in the transmission band presumption section 111 of the 1st operation gestalt, and estimate appropriate as a transmission band of a communication network will be given.

[0193] If the transmission band presumption section 811 progresses to step S1005, it will transmit the presumed band data to the video coding section 804, and will return to a step SS 1001 again.

[0194] In addition, in order to reduce the effect of partial fluctuation of a transmission band, you may make it ask for the band data equalized after inputting two or more coding packet headers, although it explained by drawing 10 as what presumes the band data S and transmits to the video coding section 804 whenever actuation of the transmission band presumption section 811 was inputted into the coding packet header.

[0195] As mentioned above, although the information receiving set 802 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, further, based on the time stump and packet size at the time of transmission and reception of two or more coding packets from which magnitude differs, it calculates the transmission band of a communication network and notifies it to the information sending set 801.

(D-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, transmit by turns the coding packet in which the information sending set 801 in a transmitting side has two kinds of magnitude to the information receiving set 802, and the information receiving set 802 in a receiving side presumes a transmission band using the difference among the two above-mentioned kinds of packet sizes. And the load of a communication network can be rationalized, without lapsing into a congestion condition, even when the information receiving set 802 which presumed the transmission band S notifies the information to the **** sending set 801, the information sending set 801 can control appropriately the informational quality and the informational amount of signs to send out and a transmission band S changes dynamically.

[0196] In this way, also when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality. And in this example, since a transmission band is presumed unlike the 1st operation gestalt, without preparing test packets other than a coding packet, the amount of transmissions can be stopped.

(E) other operation gestalt (E-1) above-mentioned the 1- although the case where dynamic-image information was communicated was explained, also when making applicable to transmission the high information and the time-series continuation information on real-time requirement, such as information other than a dynamic image, for example, the multimedia information which combined voice (audio) data, a text stream, and these, in the 5th operation gestalt, effectiveness equivalent to the operation gestalt having described can acquire.

(E-2) In the 5th above-mentioned operation gestalt, although the information sending set of a configuration of that the packet size control section 807 prepares two kinds of packet sizes, and packet **** 806 determines the magnitude of a coding packet according to the above-mentioned packet size was described, the class of the above-mentioned packet size may be an N class (N> 1) of arbitration. In this case, if the packet transmitting section 806 chooses the packet size of the above-mentioned N class in order, effectiveness equivalent to the 5th operation gestalt will be acquired.

[0197] in addition, if reference is made further, it is not necessary to necessarily perform selection of a packet size in order (for alternation to be included) (namely, the sequence of arbitration -- or -- random), and you may make it become settled in arbitration according to the coded data length transmitted Even if such, as long as the data packet from which a packet size differs is received by the information receiving set side, it is possible to presume the transmission band of a communication network.

(E-3) Although the case where generated a test packet in the information sending sets 501 and 701, and this was transmitted to the information receiving sets 502 and 702 in the above-mentioned 2nd and the 4th operation gestalt was explained Like the 5th operation gestalt, instead of generating a test packet, two or more magnitude of a coding packet is prepared, and even if it transmits the packet by which sequential creation was carried out based on this magnitude to the information receiving sets 502 and 702, effectiveness equivalent to the 2nd and 4th operation gestalten is acquired.

(E-4) the 1- although the 5th operation gestalt explained the case where band data, a coding time stump, a coding packet size, and a coding parameter were used, as data with which an information receiving set (102, 502, 602, 702, 802) controls an information sending set (101, 501, 601, 701, 801), you may make it use combining these data

[0198] For example, a processing block equivalent to the coding parameter demand section 712 explained with the packet size demand section 612 explained with the 3rd operation gestalt and the 4th operation gestalt is established in the information receiving set 502 of the 2nd operation gestalt. It constitutes so that the output (band data and packet header) from the transmission band presumption section 811 may be inputted also into two above-mentioned blocks, and you may make it notify a coding time stump, a coding packet size, and a coding parameter to the information sending set 501.

[0199] in this case, in addition to the transit delay of a communication network being canceled based on a coding time stump, the transit delay of a communication network is fixed-ized based on a coding packet size, and optimization of coding is further performed based on a coding parameter -- ******** -- the 2- each effectiveness of having explained with the 4th operation gestalt can be acquired to coincidence.

(E-5) the 1- in the 4th operation gestalt, although the case where inserted a test packet in N+1 packet once, and it was transmitted to it was described, this test packet may be inserted irregularly.

(E-6) the 1- although any [communication network] explanation was not given with the 5th operation gestalt, even if this communication network is a communication network of a cable system and it is a communication network (the wireless system which uses a satellite is included) of a wireless system, it is applicable.

(E-7) a "transmission control function" according to claim 1 -- the 1- the various control action based on the control information (band data, a coding time stump, a coding packet size, coding parameter) notified from the information receiving set explained with the 5th operation gestalt shall be included

[0200]

[Effect of the Invention] According to this invention, as mentioned above, the coded data which comes to encode the information as which real-time requirement or a time series continuity is required When communicating through the communication network with which a transmission band may be changed according to a load profile initiation, When a data receiving side presumes the transmission band of a communication network, and notifies a data source of the transmission control directions based on this and the data source controlled data transmission based on transmission control directions, a transmission band can reflect the fluctuation in communications control also under the situation that it may change dynamically.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the data communication unit (the data source and data sink) which transmits the real-time continuation information on a video signal, a sound signal, and others using packet communication networks, such as LAN. Moreover, it is related with the data communication approach suitable for the communication link using this data communication unit.

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PRIOR ART

[Description of the Prior Art] Reference name: When using the communication network (for example, LAN) whose JP,9-321798,A transmission band is not fixed for the communication link of the information required of real-time continuation transmission of a TV phone etc., processing of changing the coding rate of a transmitting side according to the loaded condition of a communication network is needed.

[0003] Conventionally, there are some which are indicated by the above-mentioned reference as this kind of a data communication unit. Drawing 2 is an example of the data communication unit indicated by the above-mentioned reference. The data communication unit of this reference turns into the information sending set 201 and the information receiving set 202 from a communication network 203. Furthermore, the information receiving set 202 includes the transit delay presumption means 204 and the renewal demand means 205 of a coding rate.

[0004] After encoding the dynamic image inputted with the camera etc., the information sending set 201 packet-izes this, and transmits it to a communication network 203. On the other hand, the information receiving set 202 decodes the packet data received through the communication network 203, and outputs them to a television monitor etc. At this time, the transit delay presumption means 204 presumes the amount of transit delays of a communication network 203.

[0005] Here, by the above-mentioned reference, it asks for estimate delta[of the amount of transit delays] t [sec/bit] from the following (1) type using bit rate [of the packet data which the information receiving set 202 received from time of day 0 from time of day t by average bit rate / of the packet data which the information sending set 201 transmitted by time of day T / R [bps], and time-of-day t+T] r [bps].

[0006]

$deltat=1/r-1/R$ -- (1)

However, time of day t is time of day when the data transmitted to time of day 0 from the information sending set 201 reach the information receiving set 202.

[0007] In addition, since the value of the parameter R used for presumption of the amount of transit delays is beforehand notified to the transit delay presumption means 204 from the information sending set 201, the transit delay presumption means 204 calculates estimate deltat by measuring Parameter r to every time interval T.

[0008] Next, the renewal demand means 205 of a coding rate asks for desired value R[of a coding rate]' [bps] by the following (2) formulas, when the difference of estimate deltat of the amount of transit delays and the desired value K of a transit delay is large.

[0009]

$R'=r/(1-r\cdot K)$ -- (2)

This desired value R' is a coding rate required of the information sending set 201 in order to bring the amount of transit delays (correctly that estimate deltat) close to desired value K.

[0010] The information receiving set 202 sends desired value R' of the above-mentioned coding rate to the **** sending set 201 through a communication network 203.

[0011] If this desired value R' is received, the information sending set 201 will control a coding rate so that a transmitting bit rate becomes R'.

[0012] Thus, the technique which rationalizes the load of a communication network in macro is shown to above-mentioned reference by by changing a coding rate so that the amount of transit delays (correctly estimate deltat) may be brought close to desired value K.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, as mentioned above, the coded data which comes to encode the information as which real-time requirement or a time series continuity is required When communicating through the communication network with which a transmission band may be changed according to a load profile initiation, When a data receiving side presumes the transmission band of a communication network, and notifies a data source of the transmission control directions based on this and the data source controlled data transmission based on transmission control directions, a transmission band can reflect the fluctuation in communications control also under the situation that it may change dynamically.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, with the equipment of the above-mentioned configuration, since the desired value K of the amount of transit delays is defined beforehand and a coding rate is changed corresponding to this, when the band of a communication network 203 changes dynamically, the load of a communication network 203 is not necessarily rationalized. That is, if the band of a communication network 203 becomes narrower than coding rate desired value R' given by (2) formulas, the information sending set 201 will transmit data superfluously, and a communication network 203 will lapse into a congestion condition.

[0014] For this reason, when the technique concerned was applied to transmission of the real-time continuation information on a video signal, a sound signal, and others, there was a problem from which it becomes difficult to maintain the stable quality.

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MEANS

[Means for Solving the Problem] (A) In order to solve this technical problem, in case the coded data which comes to encode the information as which real-time requirement or a time series continuity is required in this invention is communicated through the communication network with which a transmission band may be changed according to a load profile initiation, (1) data receiving side presumes the transmission band of a communication network, and notifies a data source of the transmission control directions based on this, and (2) data sources control data transmission based on transmission control directions. By this control, a transmission band can reflect the fluctuation in communications control also under the situation that it may change dynamically.

(B) Here, in order to enable presumption of a transmission band, (1) data source shall record the packet size and the time stump which gives transmitting time of day on each of a transmitting packet, and shall transmit to it, and (2) data receiving side shall presume a transmission band based on the time stump which gives the packet size and transmitting time of day which are recorded on the receipt time of a data packet, and a data packet.

[0016] In addition, in that case, a data source is the packet prepared apart from the coding packet obtained from coded data, and it is desirable to make the redundancy packet in which the packet size differs from it of a coding packet intermingled, and to transmit. Or it is desirable for a data source to make the coding packet which differs in a packet size intermingled, and to transmit.

(C) Moreover, when the amount of transit delays is presumed and the amount of transit delays exceeds a predetermined threshold as an example of transmission control directions from the packet size of the transmission band which the data receiving side presumed, and the actually received data packet, notify the coding time stump which requires the dissolution of delay of a data source.

[0017] When a coding time stump is notified for a data source from a data receiving side at this time, all the coded data and coding packets under current processing are canceled. Coding processing and transmission processing are resumed from the coded data newly inputted after that and a coding packet. Record a coding time stump with a notice on the coding packet generated by the beginning after a restart, and it transmits to it. Moreover, if a data receiving side supervises reception of a coding packet with the same coding time stump as the above-mentioned coding time stump notified previously and it is made to resume the usual reception actuation from the coding packet concerned after the confirmation of receipt Rationalization of the load given to a communication network with the dissolution of a transit delay is realizable.

(D) Moreover, when a data receiving side maintains the amount of delay at a predetermined value under the situation of the presumed transmission band as an example of transmission control directions, ask for a required packet size. When the difference of the called-for packet size and the packet size of the actually received data packet exceeds a predetermined threshold, or when those ratios exceed the predetermined range, A data source is notified by making the packet size for which it asked from the presumed transmission band into a coding packet size. If a data source changes into a coding packet size with a notice the packet size of the coding packet sent out after that when a coding packet size is notified from a data receiving side A transit delay can be kept constant also when changing the transmission band of a communication network dynamically.

A data receiving side as an example of transmission control directions (E) Moreover, a data receiving side It asks for the coding parameter controlled in the range which does not exceed the transmission band presumed in the bit rate of the coded data generated in a data source. Notify a data source of the coding parameter concerned, and if a data source controls coding processing based on the coding parameter concerned when a coding parameter is notified from a data receiving side Also when changing the transmission band of a communication network dynamically, the load which controls the amount of information generated in a transmitting side, and is applied to a communication network can be optimized.

[0018]

[Embodiment of the Invention] The operation gestalt in the case of using the data communication unit concerning this invention for the communication link of an image (video) signal hereafter is explained.

(A) The functional-block configuration of the video communication device applied to the 1st operation gestalt at the 1st operation gestalt (A-1) equipment configuration drawing 1 is shown. In addition, drawing 1 is a configuration when [expedient] using for explanation of an operation gestalt, and can arrange these functions dispersively to two or more equipments (case) with actual equipment. The same is said of the case of other operation gestalten mentioned later.

[0019] The video communication device concerning the 1st operation gestalt consists of the information sending set 101 and the information receiving set 102 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 101 and the information receiving set 102. Drawing 1 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0020] A video camera 103, the video coding section 104, the coding packet generation section 105, the packet transmitting section 106, and the test packet generation section 107 are formed in the information sending set 101 formed in a transmitting side.

[0021] Here, a video camera 103 is a means for outputting the dynamic-image data which picturized and obtained the real space image to the video coding section 104. In addition, in drawing 1 , although the image pick-up means is used for incorporation of dynamic-image data, the dynamic-image (it reproduced) data read from the storage may be used.

[0022] The video coding section 104 is a means to encode based on the band data given through a communication network from the transmission band presumption section 111 which mentions later the dynamic-image data inputted from a video camera 103. The dynamic-image data after coding are outputted to the coding packet generation section 105 as a coding stream.

[0023] The coding packet generation section 105 is a means to packet-ize the coding stream inputted from the video coding section 104. In addition, the packet-ized coding stream is outputted to the packet transmitting section 106 as a coding packet.

[0024] The test packet generation section 107 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 106. In addition, that in which the magnitude differs from the magnitude of a coding packet is used for a test packet. It mentions later for details.

[0025] The packet transmitting section 106 is a means to send out the coding packet inputted from the coding packet generation section 105, and the test packet inputted from the test packet generation section 107 to a communication network. In addition, the sent-out data packet is transmitted to the information receiving set 102 through a communication network.

[0026] On the other hand, the packet receive section 108, the video decode section 109, a monitor 110, and the transmission band presumption section 111 are formed in the information receiving set 102 formed in a receiving side.

[0027] Here, the packet receive section 108 is a means to input a data packet from a communication network. The packet receive section 108 outputs a coding packet to the video decode section 109 among the received data packets, and outputs a packet header to the transmission band presumption section 111.

[0028] The video decode section 109 is a means to input a coding packet and to decode from the packet receive section 108 to dynamic-image data. In addition, the decoded dynamic-image data are outputted to a monitor 110.

[0029] A monitor 110 is a means to display the dynamic-image data inputted from the video decode section 109.

[0030] The transmission band presumption section 111 is a means to presume the band of the communication network which changes serially using a packet header, and to output to a transmitting side by using a presumed result as band data.

(A-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(A-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 103. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 104 from a video camera 103.

[0031] The video coding section 104 encodes the inputted dynamic-image data based on band data, and outputs a corresponding coding stream. Here, band data are given from the transmission band presumption section 111 of a receiving side. Band data are a value showing the transmission band of the communication network at the time of transmitting a data packet from the information sending set 101 to the information receiving set 102.

[0032] The video coding section 104 controls a frame rate and image quality so that the bit rate of a coding stream does not exceed a transmission band. This control is realized by the predetermined parameter (a frame rate and image quality control parameter). Of course, it is also possible to calculate this parameter based on the value of the received band data each time, and to ask it for it. However, with this operation gestalt, it shall encode with reference to one of these tables based on the value of the band data with which two or more correspondence tables which defined the relation between the value of band data and a parameter (a frame rate and image quality control parameter) should be beforehand prepared, and the video coding section 104 was given.

[0033] The correspondence table referred to is chosen according to liking (image quality priority, motion priority, etc.) of the user of the information sending set 101. In addition, a predetermined default is used for the period as which band data are not inputted from the transmission band presumption section 111 at the time of initiation of operation as band data. This default is set up in accordance with a demand of for example, an equipment user.

[0034] The encoded dynamic-image data are given to the coding packet generation section 105 as a coding stream. The coding packet generation section 105 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 106 as a coding packet. Although well-known technique may be conventionally used for the approach of division of a packet, it is divided with this operation gestalt so that it may become the magnitude of the immobilization which defined the coding stream beforehand.

[0035] Drawing 3 is the example of a configuration of a data packet. 301 express the configuration of a coding packet among drawing. It consists of a time stump TS (303 in drawing), a packet size PS (304 in drawing) and sequence number SE (305 in drawing), and frame status STAT (306 in drawing), and data DAT A (307 in drawing), the inside 302-306 of drawing corresponds to a packet header, and a coding packet corresponds to the coding stream by which 307 was divided. [a packet class flag (302 in drawing) with the fixed value 0,]

[0036] In case the coding packet generation section 105 prepares a packet header, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 101, sets a packet size PS based on the magnitude of a coding packet, sets a sequence number SEQ based on the identification number of the coding packet under processing, and sets the frame status STAT based on the positional information on the dynamic-image frame to which the coding packet under processing corresponds (a frame start, the center of a frame, frame termination, etc.).

[0037] Next, the packet transmitting section 106 will transmit to the packet receive section 108 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 105. In addition, the packet transmitting section 106 requires a test packet of the test packet generation section 107 as the N+1st packets.

[0038] If the demand of a test packet is received from the packet transmitting section 106, the test packet generation section 107 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 106.

[0039] 308 of drawing 3 expresses the configuration of a test packet. A test packet consists of a packet class flag (309 in drawing) with the fixed value 1, and a packet size PS (311 in drawing) and a test data TEST (312 in drawing), and the inside 309-311 of a Fig. corresponds to a packet header inside. [a time stump TS (310 in drawing), and]

[0040] In case the test packet generation section 107 prepares a test packet, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 101, sets a packet size PS based on the magnitude of a test packet, and sets the test data TEST of arbitration.

[0041] The packet transmitting section 106 will transmit to the packet receive section 108 by making this into a data packet, if a test packet is inputted from the test packet generation section 107. Then, whenever the packet transmitting section 106 transmits the coding packet of N individual to the packet receive section 108, it transmits one test packet to the packet receive section 108, and repeats these processings.

[0042] As mentioned above, the information sending set 101 in this operation gestalt receives the notice of the transmission band of a communication network from the information receiving set 102, and performs coding control according to this while it transmits a coding packet and a test packet to the information receiving set 102.

(A-2-2) If the packet receive section 108 of a receiving side of operation receives a data packet from the packet transmitting section 106, based on the packet class flag of a packet header, this packet will judge a coding packet or a test packet.

[0043] The packet receive section 108 outputs the packet header taken out from the data packet to the transmission band presumption section 111 while outputting this to the video decode section 109, if a coding packet is detected.

[0044] If a coding packet is inputted from the packet receive section 108, the video decode section 109 will take out data DAT A corresponding to the divided coding stream based on the packet size PS of a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0045] Moreover, if it judges that the video decode section 109 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 110.

[0046] A monitor 110 will display this on display DEPAISU, such as a CRT display, if dynamic-image data are inputted from the video decode section 109.

[0047] On the other hand, the transmission band presumption section 111 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 108, and transmits to it by making this into band data at the video coding section 104.

[0048] Drawing 4 is a flow chart which shows the procedure of the transmission band presumption section 111. If a packet header is first received at step S401, the transmission band presumption section 111 will be the following step S402, and will judge whether it is a test packet header or it is a coding packet header.

[0049] When a test packet header is detected at step S402, the transmission band presumption section 111 progresses to step S404. At step S404, the transmission band presumption section 111 takes out a time stump TS and a packet size PS from a packet header, and is parameter t1A and n1, respectively. It stores. Furthermore, the transmission band presumption section 111 measures the present time of day using the internal clock of the information receiving set 102, stores this in parameter t1B, and returns to step S401.

[0050] On the other hand, when a coding packet header is detected at step S402, the transmission band presumption section 111 progresses to step S403. At step S403, the transmission band presumption section 111 takes out a time stump TS and a packet size PS from a packet header, and is parameter t2A and n2, respectively. It stores. Furthermore, the transmission band presumption section 111 measures the present time of day using the internal clock of the information receiving set 102, stores this in parameter t2B, and progresses to step S405.

[0051] The transmission band presumption section 111 which progressed to step S405 judges whether a test packet is effective. That is, when step S404 is not once performed after processing initiation of the transmission band presumption section 111, the transmission band presumption section 111 judges that a test packet is invalid, and returns to step S404. On the other hand, in other than the above, the transmission band presumption section 111 judges that a test packet is effective, and progresses to step S406. If it progresses, based on the following (3) types, the transmission band presumption section 111 presumes the transmission band S of a communication network, and when [which is step S406] a presumed result is obtained, it will progress to step S407.

[0052]

$S=(n2-n1)/\{(t2B-t2A)-(t1B-t1A)\}$ -- (3)

If the transmission band presumption section 111 progresses to the following step S407, it will transmit the presumed band data S to the video coding section 104, and will return to step S401 again.

[0053] Here, the semantics of above-mentioned (3) types is explained. Since the information sending set 101 and the information receiving set 102 are isolated systems connected through the communication network, they have an internal clock different, respectively. Then, the time difference of both internal clock is set to T. the time of day when a packet will be transmitted with the information sending set 101 if a test packet is observed -- t1B and its magnitude -- n1 it is . the time of day when the same packet is received with the information receiving set 102 on the other hand -- t1B -- it is -- the magnitude -- n2 it is .

[0054] It is n1 when the transmission band of a communication network is S [bps]. The transit delay to the packet of [bit] is given by n1 / S [sec], and the following (4) types are realized.

[0055]

$t1B-t1A=n1/S+T$ -- (4)

If it asks for the same relation paying attention to a coding packet, the following (5) types will be realized.

[0056]

$t2B-t2A=n2/S+T$ -- (5)

From above-mentioned (4) types and (5) types, elimination of the time difference T of an internal clock materializes above-mentioned (3) types. Therefore, (3) types will give estimate appropriate as a transmission band of a communication network.

[0057] In addition, after inputting two or more test packet headers and coding packet headers, you may make it have explained by drawing 4 , as what presumes the band data S and transmits to the video coding section 104, whenever actuation of the transmission band presumption section 111 was inputted into the coding packet header, but ask for the equalized band data S, in order to reduce the effect of partial fluctuation of a transmission band.

[0058] As mentioned above, the information receiving set 102 concerning this operation gestalt decodes a coding packet, and reproduces and displays dynamic-image data. In addition, the information receiving set 102 presumes the transmission band S of a communication network based on the time stump and packet size at the time of transmission and reception of a coding packet and a test packet, and notifies this to the information sending set 101 which is a transmitting side.

(A-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 101 in a transmitting side sends out, transmit, and the information receiving set 102 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. And the load of a communication network can be rationalized, without lapsing into a congestion condition, even when the information receiving set 102 which presumed the transmission band S notifies the information to the information sending set 101, the information sending set 101 can control appropriately the informational quality and the informational amount of signs to send out and a transmission band S changes dynamically.

[0059] In this way, also when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality. And it is the information sending set 101, and since coding actuation is controlled, an intention of the user of the information sending set 101 can be made to reflect in the quality of the information to transmit in this operation gestalt.

(B) The functional-block configuration of the video communication device applied to the 2nd operation gestalt at the 2nd operation gestalt (B-1) equipment configuration drawing 5 is shown.

[0060] Also about the video communication device concerning the 2nd operation gestalt, the basic configuration is the same as that of the 1st operation gestalt, and consists of the information sending set 501 and the information receiving set 502 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 501 and the information receiving set 502. Drawing 5 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0061] A video camera 503, the video coding section 504, the coding packet generation section 505, the packet transmitting section 506, and the test packet generation section 507 are formed in the information sending set 501 formed in a transmitting side.

[0062] Here, a video camera 503 and the video camera 103 of the 1st operation gestalt are the same equipment. That is, a video camera 503 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 504. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 503 but from the storage.

[0063] The video coding section 504 is a means to encode the dynamic-image data inputted from a video camera 503, and to output to the coding packet generation section 505 by making the dynamic-image data after coding into a coding stream.

[0064] In addition, when a coding time stump is inputted through a communication network from the delay dissolution demand section 512 mentioned later, the video coding section 504 outputs the coding time stump which stopped the coding processing to a current frame and was received to the latter part, and when a new frame is given from a video camera 503 after that, it resumes coding processing.

[0065] The coding packet generation section 505 is a means to packet-ize the coding stream or coding time stump inputted from the video coding section 504. The packet-ized data are outputted to the packet transmitting section 506 as a coding packet. In addition, when a coding time stump is inputted, the coding packet generation section 505 sets an internal clock by the value of a coding time stump while discarding all the coding streams that remain inside at the time.

[0066] The test packet generation section 507 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 106. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0067] The packet transmitting section 506 is a means to send out the coding packet inputted from the coding packet generation section 505, and the test packet inputted from the test packet generation section 107 to a communication network. In addition, when inputted from the delay dissolution demand section 512 which a coding time stump mentions later, the packet transmitting section 506 discards all the packets that remain at the time, and it interrupts transmitting processing of data temporarily until the time stump given to the packet newly inputted after that is in agreement with a coding time stump.

[0068] On the other hand, the packet receive section 508, the video decode section 509, a monitor 510, the transmission band presumption section 511, and the delay dissolution demand section 512 are formed in the information receiving set 502 formed in a receiving side.

[0069] Here, the packet receive section 508 is a means to input a data packet from a communication network. The packet receive section 508 outputs a coding packet to the video decode section 509 among the received data packets, and outputs a packet header to the transmission band presumption section 511. In addition, the packet receive section 508 makes a processing object only what has a time stump newer than a coding time stump among the data packets which discard all the coding packets that remain inside and arrive after that at the time, when a coding time stump is inputted from the delay dissolution demand section 512.

[0070] The video decode section 509 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 508. In addition, the decoded dynamic-image data are outputted to a monitor 510.

[0071] A monitor 510 is a means to display the dynamic-image data inputted from the video decode section 509.

[0072] The transmission band presumption section 511 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the packet header used for the presumed band data and its presumption is outputted to the delay dissolution demand section 512.

[0073] The delay dissolution demand section 512 presumes a transit delay using the band data and the packet header which are given from the transmission band presumption section 511, and when a presumed result is excessive, it is a means to aim at the dissolution. When a presumed result is larger than a predetermined threshold, specifically, a coding time stump is outputted to a transmitting side.

(B-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(B-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 503. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 504 from a video camera 503.

[0074] Unless the coding time stump is inputted from the delay dissolution demand section 512, the video coding section 504 encodes the inputted dynamic-image data, and outputs a corresponding coding stream. On the other hand, when a coding time stump is inputted from the delay dissolution demand section 512, the video coding section 504 stops the coding processing of a dynamic-image frame which was being performed till then, replaces it with a coding stream, and outputs a coding time stump. In addition, the video coding section 504 outputs after the output of this coding time stump as a coding stream which inputs the following data of a new dynamic-image frame, encodes this, and corresponds from a video camera 503.

[0075] If a coding stream is inputted from the video coding section 504, like the coding packet generation section 105 explained with the 1st operation gestalt, the coding packet generation section 505 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 506 as a coding packet. In addition, also in this operation gestalt, with this operation gestalt, although well-known technique may be conventionally used for the approach of division of a packet, it divides so that it may become the magnitude of the immobilization which defined the coding stream beforehand.

[0076] Moreover, if a coding time stump is inputted from the video coding section 504, the coding packet generation section 505 will cancel all the data of the coding stream which remains in the interior, and it will operate so that the internal clock of the information sending set 501 may be set by the value of a coding time stump. The coding packet generation section 505 sets this value to coincidence as a time stump TS in a packet header.

[0077] Next, the packet transmitting section 506 will transmit to the packet receive section 508 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 505.

[0078] However, the packet transmitting section 506 cancels all the data of the coding packet which remains in the interior, when a coding time stump is inputted from the delay dissolution demand section 512. Then, the packet transmitting section 506 supervises the packet header of the coding packet more newly than the coding packet generation section 505 inputted, and it does not transmit a data packet until the value of the time stump TS given to this is in agreement with the value of the above-mentioned coding time stump. Then, the packet transmitting section 506 transmits to the packet receive section 508 by making a coding packet into a data packet again.

[0079] In addition, if the packet transmitting section 506 transmits to the packet receive section 508 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 507 as the N+1st packets.

[0080] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 506, the test packet generation section 507 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 506.

[0081] The packet transmitting section 506 will transmit to the packet receive section 508 by making this into a data packet, if a test packet is inputted from the test packet generation section 507. Then, whenever the packet transmitting section 506 transmits the coding packet of N individual to the packet receive section 508, it transmits one test packet to the packet receive section 508, and repeats these processings.

[0082] As mentioned above, although the information sending set 501 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 502 to predetermined timing When it differs in the information sending set 101 concerning the 1st operation gestalt and a coding time stump is received from the delay dissolution demand section 512 in the information receiving set 502 Are in the information sending set 501 and all of the coding stream which is not transmitted to the information receiving set 502 yet and a coding packet are canceled. What gave the above-mentioned coding time stump to the packet header of the data packet which packet-ized the newest dynamic-image data is transmitted to the information receiving set 502.

(B-2-2) If the packet receive section 508 of a receiving side of operation receives a data packet from the packet transmitting section 506 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0083] The packet receive section 508 outputs the packet header taken out from the data packet to the transmission band presumption section 251 while outputting this to the video decode section 509, if a coding packet is detected.

[0084] However, when a coding time stump is inputted from the delay dissolution demand section 512, the packet receive section 508 cancels all the coding packets that remain in the interior, and does not perform any output to a data packet with the time stump TS older than the above-mentioned coding time stump in a packet header.

[0085] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 508, the video decode section 509 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0086] Moreover, if it judges that the video decode section 509 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 510.

[0087] A monitor 510 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 509.

[0088] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 511 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 508, and transmits to it by making this into band data at the delay dissolution demand section 512. Here, the transmission band presumption section 511 presumes a transmission band based on above-mentioned (3) types. In addition, the transmission band presumption section 511 outputs a packet header to the delay dissolution demand section 512 with the band data concerned.

[0089] The delay dissolution demand section 512 will presume the transit delay of a communication network, if band data and a packet header are inputted from the transmission band presumption section 511. Here, the delay dissolution demand section 512 calculates a transit delay D [sec] based on the following (6) types using the packet size PS [bit] in band data S [bps] and a packet header.

[0090]

$D=PS/S$ -- (6)

If a transit delay D can be found by count in this way, when the transit delay D concerned judges whether it is larger than a predetermined threshold and it judges that it is large, the delay dissolution demand section 512 will judge that it is necessary to cancel delay of a communication network, and will output a coding time stump. This coding time stump is outputted to the video coding section 504, the packet transmitting section 506, and the packet receive section 508. In other than the above, no delay dissolution demand sections 512 are outputted.

[0091] In addition, what is necessary is just to define the above-mentioned predetermined threshold according to the application and specification of a system. With this operation gestalt, 2 seconds is set up as threshold value of the transit delay at which the real-time communication link to the information receiving set 502 from the information sending set 501 is maintained, for example.

[0092] Incidentally, the above-mentioned coding time stump is the time stump TS of the packet header given to the data packet of the beginning after canceling delay of a communication network, and the delay dissolution demand section 512 determines the value TS 2 of a coding time stump using the following (7) types.

[0093]

$TS2=TS1+D+C$ -- (7)

However, TS1 is the time stump TS in the packet header inputted from the transmission band presumption section 511. Moreover, D is a transit delay given by (6) formulas, and C is a forward predetermined constant. (7) Set the coding time stump received with the information sending set 501 by setting the value of C as a suitable value in a formula as a value newer than the time stump of which data packet currently processed within the information sending set 501.

[0094] As mentioned above, although the information receiving set 502 concerning this operation gestalt operates so that a coding packet may be decoded and dynamic-image data may be reproduced and displayed, they differ in the information receiving set 102 of the 1st operation gestalt, and presume the transit delay of a communication network further after presuming a transmission band from the information on the packet header of a coding packet and a test packet.

[0095] And when the transit delay is what needs a dissolution, while transmitting a coding time stump to the information sending set 501, actuation which resumes decode actuation from the coding packet to which the above-mentioned coding time stump which is in the information receiving set 502, cancels all the coding packets that are not decoded yet, and comes after that was given is performed.

(B-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 501 in a transmitting side sends out, transmit, and the information receiving set 502 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 502 determines the timing which cancels a transit delay D based on this transmission band S, and notifies this to the information sending set 501.

[0096] Thereby, the information sending set 501 cancels an internal unnecessary buffer, and newly starts coding. On the other hand, if a transit delay dissolution is determined, the information receiving set 502 will cancel an internal unnecessary buffer, and will decode only the coding packet processed with the information sending set 501 after the signal of a transit delay dissolution.

[0097] Therefore, also when [of the case where a transit delay increases when the transmission band of a communication network changes dynamically, the information sending set 501, or the information receiving set 502] a transit delay increases more deficient in performance, a transit delay can be canceled and the load of a communication network can be rationalized.

[0098] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

(C) The functional-block configuration of the video communication device applied to the 3rd operation gestalt at the 3rd operation gestalt (C-1) equipment configuration drawing 6 is shown.

[0099] Also about the video communication device concerning the 3rd operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 601 and the information receiving set 602 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 601 and the information receiving set 602. Drawing 6 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0100] A video camera 603, the video coding section 604, the coding packet generation section 605, the packet transmitting section 606, and the test packet generation section 607 are formed in the information sending set 601 formed in a transmitting side.

[0101] The video camera 603 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 603 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 604. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 603 but from the storage.

[0102] The video coding section 604 is a means to encode the dynamic-image data inputted from a video camera 601, and to output to the coding packet generation section 605 by making the dynamic-image data after coding into a coding stream.

[0103] The coding packet generation section 605 is a means to packet-ize the coding stream inputted from the video coding section 604. In the case of this packet-izing, the coding packet generation section 605 is given through a communication network from the packet size demand section 612 mentioned later, and uses a ****** coding packet size. The packet-ized data are outputted to the packet transmitting section 606 as a coding packet.

[0104] The test packet generation section 607 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 606. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0105] The packet transmitting section 606 is a means to output the coding packet inputted from the coding packet generation section 605, and the test packet inputted from the test packet generation section 607 to a communication network.

[0106] On the other hand, the packet receive section 608, the video decode section 609, a monitor 610, the transmission band presumption section 611, and the packet size demand section 612 are formed in the information receiving set 602 formed in a receiving side.

[0107] Here, the packet receive section 608 is a means to input a data packet from a communication network. The packet receive section 608 outputs a coding packet to the video decode section 609 among the received data packets, and outputs a packet header to the transmission band presumption section 611.

[0108] The video decode section 609 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 608. In addition, the decoded dynamic-image data are outputted to a monitor 610.

[0109] A monitor 610 is a means to display the dynamic-image data inputted from the video decode section 609.

[0110] The transmission band presumption section 611 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the packet header used for the presumed band data and its presumption is outputted to the packet size demand section 612.

[0111] The packet size demand section 612 is a means to compute the coding packet size suitable for a current communication link situation using the band data and the packet header which are given from the transmission band presumption section 611. In addition, the computed coding packet size is outputted to a transmitting side.

(C-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(C-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 603. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 604 from a video camera 603.

[0112] Next, dynamic-image data will be encoded and the video coding section 604 will output a corresponding coding stream, if dynamic-image data are inputted from a video camera 603.

[0113] If a coding stream is inputted from the video coding section 604, like the coding packet generation section 605 explained with the 1st operation gestalt, the coding packet generation section 605 divides this into a packet, and attaches attached data (packet header) for every packet. Thereby, a coding stream is packet-ized and is outputted to the packet transmitting section 606 as a coding packet.

[0114] However, if a coding packet size is inputted from the packet size demand section 612, the coding packet generation section 605 will change into the same value as the above-mentioned coding packet size the packet size which gives a division unit, and will divide a coding stream using this value henceforth.

[0115] Like the packet transmitting section 106 of the 1st operation gestalt, the packet transmitting section 606 will transmit to the packet receive section 608 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 605.

[0116] However, if the packet transmitting section 606 transmits to the packet receive section 608 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 607 as the N+1st packets.

[0117] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 606, the test packet generation section 607 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 606.

[0118] The packet transmitting section 606 will transmit to the packet receive section 608 by making this into a data packet, if a test packet is inputted from the test packet generation section 607. Then, whenever the packet transmitting section 606 transmits the coding packet of N individual to the packet receive section 608, it transmits one test packet to the packet receive section 608, and repeats these processings.

[0119] As mentioned above, although the information sending set 601 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 602, in the information sending set 101 concerning the 1st operation gestalt, they differ and update the magnitude of the coding packet which transmits according to directions of the information receiving set 602.

(C-2-2) If the packet receive section 608 of a receiving side of operation receives a data packet from the packet transmitting section 606 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0120] The packet receive section 608 outputs the packet header taken out from the data packet to the transmission band presumption section 611 while outputting this to the video decode section 609, if a coding packet is detected.

[0121] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 608, the video decode section 609 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0122] Moreover, if it judges that the video decode section 609 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 610.

[0123] A monitor 610 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 609.

[0124] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 611 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 608, and outputs it to it by making this into band data at the packet size demand section 612. Here, the transmission band presumption section 611 presumes a transmission band based on above-mentioned (3) types. In addition, the transmission band presumption section 611 outputs a packet header to the packet size demand section 612 with the band data concerned.

[0125] The packet size demand section 612 will calculate the value PS of the coding packet size to which the information sending set 601 was suitable for using for division of a coding packet [bit] based on the following (8) types using band data S [bps] and a transit delay D [sec], if band data and a packet header are inputted from the transmission band presumption section 611.

$PS=SxD$ -- (8)

Here, the transit delay D used for count shall be a fixed value chosen from within the limits of the transit delay required of a system, for example, the user of a system shall set it up beforehand.

[0126] If the coding packet size PS can be found by count in this way, the packet size demand section 612 will transmit the coding packet size PS which was able to be found by (8) types in the value of the coding packet size PS concerned when both difference was larger than a predetermined threshold, or when predetermined was out of range as compared with the value of the packet size in a packet header as for both ratio to the coding packet generation section 605.

[0127] Consequently, when the magnitude of the coding packet used with the information sending set 601 is changed into the coding packet size PS, to the communication network of a transmission band S, a transit delay D will be given by D=PS/S and a fixed transit delay will be maintained.

[0128] As mentioned above, although the information receiving set 602 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, they differ in the information receiving set 102 of the 1st operation gestalt, calculate the packet size PS for making a transit delay D fixed-ize using the transmission band S of the communication network presumed from the information on the packet header of a coding packet and a test packet, and performs actuation notified to the information sending set 601.

(C-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 601 in a transmitting side sends out, transmit, and the information receiving set 602 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 602 determines the packet size PS for making a transit delay D fixed-ize using this transmission band S, and notifies this to the information sending set 601.

[0129] The size of the data packet outputted by this from the information sending set 601 which is a transmitting side can be changed into the packet size demanded by the receiving side, and it is maintained by the value always stabilized in the transit delay of a communication network.

[0130] Therefore, also when the transmission band of a communication network changes dynamically and a transit delay fluctuates, a transit delay can be kept constant and the load of a communication network can be rationalized.

[0131] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

(D) The functional-block configuration of the video communication device applied to the 4th operation gestalt at the 4th operation gestalt (D-1) equipment configuration drawing 7 is shown.

[0132] Also about the video communication device concerning the 4th operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 701 and the information receiving set 702 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 701 and the information receiving set 702. Drawing 7 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0133] A video camera 703, the video coding section 704, the coding packet generation section 705, the packet transmitting section 706, and the test packet generation section 707 are formed in the information sending set 701 formed in a transmitting side.

[0134] The video camera 703 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 703 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 704. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 703 but from the storage.

[0135] The video coding section 704 is a means to encode the dynamic-image data inputted from a video camera 701. The video coding section 704 uses the coding parameter given through a communication network from the coding parameter demand section 712 mentioned later in the case of this coding. The encoded dynamic-image data are outputted to the coding packet generation section 705 as a coding stream.

[0136] The coding packet generation section 705 is a means to packet-ize the coding stream inputted from the video coding section 704.

[0137] The test packet generation section 707 is a means for generating the test packet used for presuming the band of the communication network which may change dynamically. The generated test packet is outputted to the packet transmitting section 706. In addition, the same thing is used for a test packet as the 1st operation gestalt explained. That is, that in which the magnitude differs from the magnitude of a coding packet is used.

[0138] The packet transmitting section 706 is a means to output the coding packet inputted from the coding packet generation section 705, and the test packet inputted from the test packet generation section 707 to a communication network.

[0139] On the other hand, the packet receive section 708, the video decode section 709, a monitor 710, the transmission band presumption section 711, and the coding parameter demand section 712 are formed in the information receiving set 702 formed in a receiving side.

[0140] Here, the packet receive section 708 is a means to input a data packet from a communication network. The packet receive section 708 outputs a coding packet to the video decode section 709 among the received data packets, and outputs a packet header to the transmission band presumption section 711.

[0141] The video decode section 709 is a means to input a coding packet and to decode dynamic-image data from the packet receive section 708. In addition, the decoded dynamic-image data are outputted to a monitor 710.

[0142] A monitor 710 is a means to display the dynamic-image data inputted from the video decode section 709.

[0143] The transmission band presumption section 711 is a means to presume the band of the communication network which changes serially using a packet header. In addition, the presumed band data are outputted to the coding parameter demand section 712.

[0144] The coding parameter demand section 712 is a means to determine a coding parameter using the band data given from the transmission band presumption section 711. Here, the coding parameter demand section 712 determines a coding parameter that the bit rate of the coding stream generated in a transmitting side will not exceed a current transmission band. In addition, the determined coding parameter is outputted to a transmitting side.

(D-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(D-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 703. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 704 from a video camera 603.

[0145] Next, if dynamic-image data are inputted from a video camera 703, based on the coding parameter inputted from the coding parameter demand section 712, the video coding section 704 will encode dynamic-image data, and will output a corresponding coding stream.

[0146] The above-mentioned coding parameter is a parameter which controls the amount of signs, and playback quality like a frame rate or image quality control parameters (image resolution, quantization step, etc.), and the video coding section 704 encodes dynamic-image data by the well-known approach using these coding parameter conventionally.

[0147] In addition, in periods when a coding parameter is not inputted from the coding parameter demand section 712, such as the time of initiation of operation, a predetermined default is used as a coding parameter. What was set up in accordance with the demand of for example, an equipment user is used for this default.

[0148] Like the coding packet generation section 105 concerning the 1st operation gestalt, if a coding stream is inputted from the video coding section 104, the coding packet generation section 705 will divide this into a packet, will attach a packet header for every packet, and will output it to the packet transmitting section 706 as a coding packet.

[0149] Like the packet transmitting section 106 in the 1st operation gestalt, the packet transmitting section 706 will transmit to the packet receive section 708 by making the coding packet of N individual into a data packet, if a coding packet is inputted from the coding packet generation section 705.

[0150] It is **, and if the packet transmitting section 706 transmits to the packet receive section 708 by making the coding packet of N individual into a data packet, it will require a test packet of the test packet generation section 707 as the N+1st packets.

[0151] Like the test packet generation section 107 of the 1st operation gestalt, if the demand of a test packet is received from the packet transmitting section 706, the test packet generation section 707 will generate the test packet of predetermined magnitude smaller than a coding packet, and will output it to the packet transmitting section 706.

[0152] The packet transmitting section 706 will transmit to the packet receive section 708 by making this into a data packet, if a test packet is inputted from the test packet generation section 707. Then, whenever the packet transmitting section 706 transmits the coding packet of N individual to the packet receive section 708, it transmits one test packet to the packet receive section 708, and repeats these processings.

[0153] As mentioned above, although the information sending set 701 in this operation gestalt transmits a coding packet and a test packet to the information receiving set 702, they differ in the information sending set 101 concerning the 1st operation gestalt, and is made to control coding based on the coding parameter notified from the information receiving set 702.

(D-2-2) If the packet receive section 708 of a receiving side of operation receives a data packet from the bucket transmitting section 706 like the packet receive section 108 which explained with the 1st operation gestalt, based on the packet class flag of a packet header, this packet will judge whether they are a coding packet or a test packet.

[0154] The packet receive section 708 outputs the packet header taken out from the data packet to the transmission band presumption section 711 while outputting this to the video decode section 709, if a coding packet is detected.

[0155] Like the video decode section 109 in the 1st operation gestalt, if a coding packet is inputted from the packet receive section 708, the video decode section 709 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0156] Moreover, if it judges that the video decode section 709 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 710.

[0157] A monitor 710 will display this on display devices, such as a CRT display, if dynamic-image data are inputted from the video decode section 709.

[0158] On the other hand, like the transmission band presumption section 111 in the 1st operation gestalt, the transmission band presumption section 711 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 708, and outputs it to it by making this into band data at the coding parameter demand section 712. Here, the transmission band presumption section 611 presumes a transmission band based on above-mentioned (3) types.

[0159] The coding parameter demand section 712 will calculate the coding parameter which the information sending set 701 uses for coding control, if band data are inputted from the transmission band presumption section 711. At this time, the coding parameter demand section 712 determines coding parameters, such as a frame rate and an image quality control parameter, that the bit rate of the coding stream in the information sending set 701 will not exceed a transmission band.

[0160] In the case of this operation gestalt, two or more preparation of the correspondence table on which the value of a coding control parameter is determined as the coding parameter demand section 712 by the meaning according to the value of band data shall be carried out. In this case, the coding parameter demand section 712 determines a coding parameter by referring to one of these tables. The correspondence table referred to is chosen according to liking (image quality priority, motion priority, etc.) of the user of the information receiving set 702.

[0161] Next, the coding parameter demand section 712 notifies this coding parameter to the video coding section 704, when it differs from the result which the calculated coding parameter calculated last time.

[0162] As mentioned above, although the information receiving set 702 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, unlike the information receiving set 102 in the 1st operation gestalt, it searches the optimal coding parameter using the transmission band S of the communication network presumed from the information on the packet header of a coding packet and a test packet (or count), and it operates so that it may notify to the information sending set 701.

(D-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, insert the test packet of different magnitude from a coding packet in the coding packet group which the information sending set 701 in a transmitting side sends out, transmit, and the information receiving set 702 which exists at a receiving side presumes a transmission band S using the difference among the two above-mentioned kinds of packet sizes. Furthermore, the information receiving set 702 determines the coding parameter for controlling informational quality and the informational amount of signs using this transmission band S, and notifies this to the information sending set 601.

[0163] Thereby, the information sending set 701 can always control coding processing appropriately, and it can rationalize the load of a communication network, without lapsing into a congestion condition, even when a transmission band changes dynamically.

[0164] In this way, when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality.

[0165] Moreover, since the information receiving set 702 controls coding unlike the 1st operation gestalt, an intention of the user of the information receiving set 702 can be made to reflect in informational quality according to this operation gestalt.

(E) The functional-block configuration of the video communication device applied to the 5th operation gestalt at the 5th operation gestalt (E-1) equipment configuration drawing 8 is shown.

[0166] Also about the video communication device concerning the 5th operation gestalt, the basic configuration is the same as that of other operation gestalten, and consists of the information sending set 801 and the information receiving set 802 which are connected with a communication link place through a communication network. Of course, in both directions, when sending and receiving an image (video) signal, it is prepared in the terminal of the both sides which communicate, respectively of the information sending set 801 and the information receiving set 802. Drawing 8 is an one direction and is an example in the case of sending and receiving an image (video) signal.

[0167] A video camera 803, the video coding section 804, the packet transmitting section 806, and the packet size control section 807 are formed in the information sending set

801 formed in a transmitting side.

[0168] The video camera 803 here is also the equipment with the same video camera 103 of the 1st operation gestalt. A video camera 803 outputs the dynamic-image data which picturized and obtained the real space image to the video coding section 804. In addition, the case of this operation gestalt may also be what (it reproduced) read dynamic-image data not only from what was picturized in the video camera 703 but from the storage.

[0169] The video coding section 804 is also the equipment with the same video coding section 104 of the 1st operation gestalt. That is, the video coding section 804 encodes based on band data through a communication network from the transmission band presumption section 811 which mentions later the dynamic-image data inputted from a video camera 801. The dynamic-image data after coding are outputted to the packet transmitting section 806 as a coding stream.

[0170] The packet size control section 807 is a means to give a coding packet size to the packet transmitting section 806.

[0171] The packet transmitting section 806 is a means to divide the coding stream inputted from the video coding section 804 the whole coding packet size to which it is given from the packet size control section 807, to packet-ize it, and to send out to a communication network. In addition, the sent-out data packet is transmitted to the information receiving set 802 through a communication network.

[0172] On the other hand, the packet receive section 808, the video decode section 809, a monitor 810, and the transmission band presumption section 811 are formed in the information receiving set 802.

[0173] Here, the packet receive section 808 is a means to input a data packet from a communication network. The packet receive section 808 outputs a coding packet to the video decode section 809 among the received data packets, and outputs a packet header to the transmission band presumption section 811.

[0174] The video decode section 809 is a means to input a coding packet and to decode from the packet receive section 808 to dynamic-image data. In addition, the decoded dynamic-image data are outputted to a monitor 810.

[0175] A monitor 810 is a means to display the dynamic-image data inputted from the video decode section 809.

[0176] The transmission band presumption section 811 is the same equipment as the transmission band presumption section 111 of the 1st operation gestalt. Namely, the transmission band presumption section 811 presumes the band of the communication network which changes serially using a packet header, and outputs it to a transmitting side by using a presumed result as band data.

(D-2) Explain communication link actuation, then communication link actuation of the video communication device concerning this operation gestalt.

(D-2-1) A three-dimension real space image is picturized as a two-dimensional planar image with **** of a transmitting side of operation, and a video camera 803. After the optical information acquired by the image pick-up is changed into an electrical signal, A/D conversion of it is carried out, and it is changed into dynamic-image data. This dynamic-image data is outputted to the video coding section 804 from a video camera 803.

[0177] The video coding section 804 encodes the inputted dynamic-image data like the video coding section 104 of the 1st operation gestalt based on band data, and outputs a corresponding coding stream. Here, band data are given from the transmission band presumption section 811 of a receiving side.

[0178] If a coding stream is inputted from the video coding section 804, the packet transmitting section 806 will divide a coding stream based on the value of the coding bucket size inputted from the packet size control section 807 mentioned later, and will create a packet. Furthermore, the packet transmitting section 806 attaches attached data (packet header) for every packet, and creates a coding packet.

[0179] Drawing 9 is drawing showing the example of a configuration of a coding packet, and 901 in drawing expresses the configuration of a coding packet. It consists of the frame status STAT (906 in drawing), and time stump TS (903 in drawing), packet size PS (904 in drawing) and sequence number SEQ (905 in drawing), and data DAT A (907 in drawing), the inside 903-906 of drawing corresponds to a packet header, and a coding packet corresponds to the coding stream by which 907 was divided.

[0180] In case the packet transmitting section 806 prepares a packet header, it sets a time stump TS based on the current time of day by the internal clock of the information sending set 801, sets a packet size PS based on the magnitude of a coding packet, sets a sequence number SEQ based on the identification number of the coding packet under processing, and sets the frame status STAT based on the positional information on the dynamic-image frame to which the coding packet under processing corresponds (a frame start, the center of a frame, frame termination, etc.).

[0181] Next, the packet transmitting section 806 transmits to the packet receive section 808 by making a coding packet into a data packet.

[0182] On the other hand, the packet size control section 807 outputs these two coding packet sizes to the packet transmitting section 806 by turns, whenever it prepares two coding packet sizes and the packet transmitting section 806 prepares a coding packet.

[0183] As the two above-mentioned coding packet sizes, it is possible to use any value. However, it is the average band of the communication network used as the example with this operation gestalt S0 It is the maximum of the transit delay in which [bps] and permission are possible D0 It gives by [sec] and is S0 xD0 to a **** case. Two of the values given by the value and S0 xD0 which are given by [bit] / 2 [bit] shall be used.

[0184] As mentioned above, the information sending set 801 in this operation gestalt receives the notice of the transmission band of a communication network from the information receiving set 802, and performs coding control according to this while it transmits a coding packet with two kinds of magnitude to the information receiving set 802 by turns.

(D-2-2) The packet receive section 808 of a receiving side of operation will output to the video decode section 809 by making this into a coding packet, if a data packet is received from the packet transmitting section 806. Moreover, the packet receive section 808 outputs the packet header taken out from the data packet to the transmission band presumption section 811.

[0185] Like the video decode section 109 of the 1st operation gestalt, if a coding packet is inputted from the packet receive section 808, the video decode section 809 will take out data DAT A corresponding to the coding stream divided based on the packet size PS in a packet header, and will perform further connection to the coding stream accumulated until now based on the sequence number SEQ in a packet header.

[0186] Moreover, if it judges that the video decode section 809 has prepared the coding stream for one frame based on the frame status STAT in a packet header, the accumulated coding stream is decoded, frame data will be reconfigurated and corresponding dynamic-image data will be outputted to a monitor 810.

[0187] A monitor 810 will display this on display devices, such as a CTR display, if dynamic-image data are inputted from the video decode section 809.

[0188] On the other hand, the transmission band presumption section 811 presumes the transmission band of a communication network at present based on the information on the packet header inputted by the packet receive section 808, and transmits to it by making this into band data at the video coding section 804.

[0189] Drawing 10 is a flow chart which shows the procedure of the transmission band presumption section 811. When a packet header is first received at step S1001, the transmission band presumption section 811 is the following step S1002, takes out a time stump TS and a packet size PS from a packet header, and is parameter t2A and n2, respectively. It stores. Furthermore, the transmission band presumption section 811 measures the present time of day using the internal clock of the information receiving set 802, stores this in parameter t2B, and progresses to step S1003.

[0190] Next, the transmission band presumption section 811 judges whether the last packet is effective in step S1003. That is, when step S1006 is not once performed yet after processing initiation of the transmission band presumption section 811, it judges that the last packet is invalid and progresses to step S1006.

[0191] At step S1006, the transmission band presumption section 811 copies a parameter (t2A, t2B, and N2) to a parameter (t1 A, t1 B and N1), and returns to step S1001.

[0192] On the other hand, in a snap S1003, when it judges that the last packet is effective, the transmission band presumption section 811 progresses to the following step S1004. At step S1004, the transmission band presumption section 811 presumes the transmission band S of a communication network based on (3) types, and progresses to step S1005. The above-mentioned (3) equation will be the same as the formula of a transmission band used in the transmission band presumption section 111 of the 1st operation gestalt, and estimate appropriate as a transmission band of a communication network will be given.

[0193] If the transmission band presumption section 811 progresses to step S1005, it will transmit the presumed band data to the video coding section 804, and will return to a step SS 1001 again.

[0194] In addition, in order to reduce the effect of partial fluctuation of a transmission band, you may make it ask for the band data equalized after inputting two or more coding packet headers, although it explained by drawing 10 as what presumes the band data S and transmits to the video coding section 804 whenever actuation of the transmission band presumption section 811 was inputted into the coding packet header.

[0195] As mentioned above, although the information receiving set 802 concerning this operation gestalt decodes a coding packet and reproduces and displays dynamic-image data, further, based on the time stump and packet size at the time of transmission and reception of two or more coding packets from which magnitude differs, it calculates the transmission band of a communication network and notifies it to the information sending set 801.

(D-3) the effectiveness of an operation gestalt -- as mentioned above, with the communication device concerning this operation gestalt, transmit by turns the coding packet in which the information sending set 801 in a transmitting side has two kinds of magnitude to the information receiving set 802, and the information receiving set 802 in a receiving side presumes a transmission band using the difference among the two above-mentioned kinds of packet sizes. And the load of a communication network can be rationalized, without lapsing into a congestion condition, even when the information receiving set 802 which presumed the transmission band S notifies the information to the **** sending set 801, the information sending set 801 can control appropriately the informational quality and the informational amount of signs to send out and a transmission band S changes dynamically.

[0196] In this way, also when transmitting real-time continuation information, such as an image (video) signal and a voice (audio) signal, it can expect to maintain the stable quality. And in this example, since a transmission band is presumed unlike the 1st operation gestalt, without preparing test packets other than a coding packet, the amount of transmissions can be stopped.

(E) other operation gestalt (E-1) above-mentioned the 1- although the case where dynamic-image information was communicated was explained, also when making applicable to transmission the high information and the time-series continuation information on real-time requirement, such as information other than a dynamic image, for example, the multimedia information which combined voice (audio) data, a text stream, and these, in the 5th operation gestalt, effectiveness equivalent to the operation gestalt having described can acquire.

(E-2) In the 5th above-mentioned operation gestalt, although the information sending set of a configuration of that the packet size control section 807 prepares two kinds of packet sizes, and packet **** 806 determines the magnitude of a coding packet according to the above-mentioned packet size was described, the class of the above-mentioned packet size may be an N class (N> 1) of arbitration. In this case, if the packet transmitting section 806 chooses the packet size of the above-mentioned N class in order, effectiveness equivalent to the 5th operation gestalt will be acquired.

[0197] in addition, if reference is made further, it is not necessary to necessarily perform selection of a packet size in order (for alternation to be included) (namely, the sequence of arbitration -- or -- random), and you may make it become settled in arbitration according to the coded data length transmitted Even if such, as long as the data packet from which a packet size differs is received by the information receiving set side, it is possible to presume the transmission band of a communication network.

(E-3) Although the case where generated a test packet in the information sending sets 501 and 701, and this was transmitted to the information receiving sets 502 and 702 in the above-mentioned 2nd and the 4th operation gestalt was explained Like the 5th operation gestalt, instead of generating a test packet, two or more magnitude of a coding packet is prepared, and even if it transmits the packet by which sequential creation was carried out based on this magnitude to the information receiving sets 502 and 702, effectiveness equivalent to the 2nd and 4th operation gestalten is acquired.

(E-4) the 1- although the 5th operation gestalt explained the case where band data, a coding time stump, a coding packet size, and a coding parameter were used, as data with which an information receiving set (102, 502, 602, 702, 802) controls an information sending set (101, 501, 601, 701, 801), you may make it use combining these data

[0198] For example, a processing block equivalent to the coding parameter demand section 712 explained with the packet size demand section 612 explained with the 3rd operation gestalt and the 4th operation gestalt is established in the information receiving set 502 of the 2nd operation gestalt. It constitutes so that the output (band data and packet header) from the transmission band presumption section 811 may be inputted also into two above-mentioned blocks, and you may make it notify a coding time stump, a coding packet size, and a coding parameter to the information sending set 501.

[0199] in this case, in addition to the transit delay of a communication network being canceled based on a coding time stump, the transit delay of a communication network is fixed-ized based on a coding packet size, and optimization of coding is further performed based on a coding parameter -- ******** -- the 2- each effectiveness of having explained with the 4th operation gestalt can be acquired to coincidence.

(E-5) the 1- in the 4th operation gestalt, although the case where inserted a test packet in N+1 packet once, and it was transmitted to it was described, this test packet may be inserted irregularly.

(E-6) the 1- although any [communication network] explanation was not given with the 5th operation gestalt, even if this communication network is a communication network of a cable system and it is a communication network (the wireless system which uses a satellite is included) of a wireless system, it is applicable.

(E-7) a "transmission control function" according to claim 1 -- the 1- the various control action based on the control information (band data, a coding time stump, a coding packet size, coding parameter) notified from the information receiving set explained with the 5th operation gestalt shall be included

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[Translation done.]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the functional-block configuration of the video communication device concerning the 1st operation gestalt.

[Drawing 2] It is drawing showing the example of equipment conventionally, and is **.

[Drawing 3] the 1- it is drawing showing the example of a configuration of the data packet used with the 4th operation gestalt.

[Drawing 4] It is drawing showing the procedure of the transmission band presumption section in the 1st operation gestalt.

[Drawing 5] It is drawing showing the functional-block configuration of the video communication device concerning the 2nd operation gestalt.

[Drawing 6] It is drawing showing the functional-block configuration of the video communication device concerning the 3rd operation gestalt.

[Drawing 7] It is drawing showing the functional-block configuration of the video communication device concerning the 4th operation gestalt.

[Drawing 8] It is drawing showing the functional-block configuration of the video communication device concerning the 5th operation gestalt.

[Drawing 9] It is drawing showing the example of a configuration of the data packet used with the 5th operation gestalt.

[Drawing 10] It is drawing showing the procedure of the transmission band presumption section in the 5th operation gestalt.

[Description of Notations]

101, 501, 601, 701, 801 -- An information sending set, 102, 502, 602, 702, 802 -- Information receiving set, 103, 503, 603, 703, 803 -- A video camera, 104, 504, 604, 704, 804 -- Video coding section, 105, 505, 605, 705 -- The coding packet generation section, 106, 506, 606, 706, 806 -- Packet transmitting section, 107, 507, 607, 707 -- The test packet generation section, 108, 508, 608, 708, 808 -- Packet receive section, 109, 509, 609, 709, 809 -- The video decode section, 110, 510, 610, 710, 810 -- Monitor, 111, 511, 611, 711, 811 [-- The coding parameter demand section 807 / -- Packet size control section.] -- The transmission band presumption section, 512 -- The delay dissolution demand section, 612 -- The packet size demand section, 712

[Translation done.]

* NOTICES *
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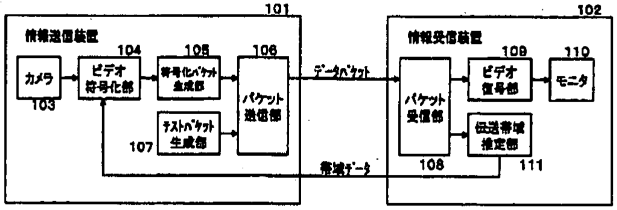
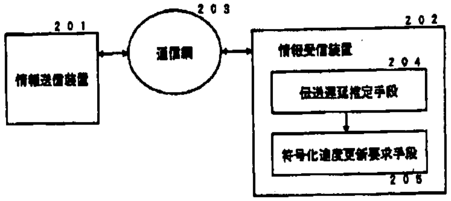
DRAWINGS

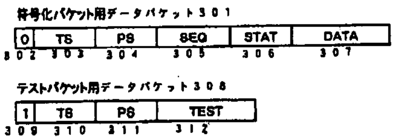
[Drawing 1]



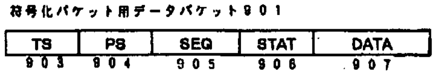
[Drawing 2]



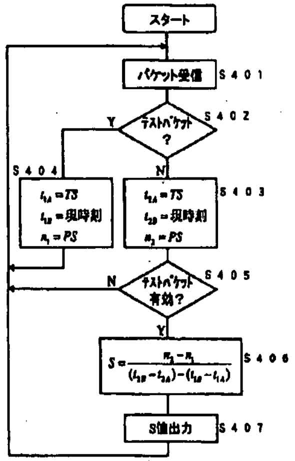
[Drawing 3]


符号化パケット用データパケット３０１
0
TS
PS
SEQ
STAT
DATA
302
303
304
305
306
307
テストパケット用データパケット３０８
1
TS
PS
TEST
309
310
311
312

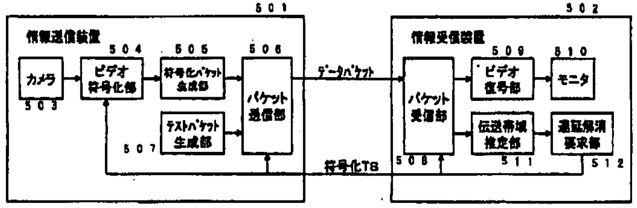
[Drawing 9]


符号化パケット用データパケット９０１
TS
PS
SEQ
STAT
DATA
903
904
905
906
907

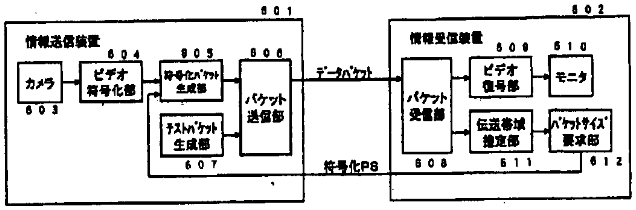
[Drawing 4]


スタート
パケット受信
S401
テストパケット?
S402
Y
N
S404
$t_{1A}=TS$
$t_{1B}=$現時刻
$n_1=PS$
S403
$t_{2A}=TS$
$t_{2B}=$現時刻
$n_2=PS$
テストパケット有効?
S405
N
Y
$S=\frac{n_2-n_1}{(t_{2B}-t_{2A})-(t_{1B}-t_{1A})}$
S406
S値出力
S407

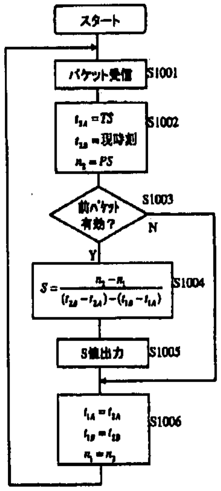
[Drawing 5]


501
情報送信装置
カメラ
503
504
ビデオ符号化部
505
符号化パケット生成部
テストパケット生成部
507
506
パケット送信部
データパケット
符号化TS
502
情報受信装置
パケット受信部
508
509
ビデオ復号部
510
モニタ
伝送帯域推定部
511
遅延解消要求部
512

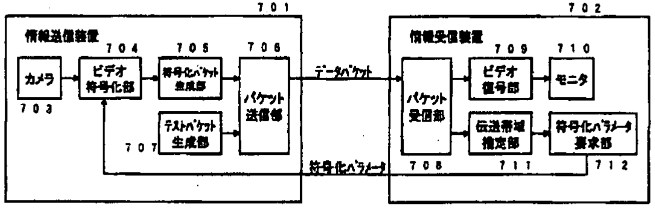
[Drawing 6]


601
情報送信装置
カメラ
603
604
ビデオ符号化部
605
符号化パケット生成部
テストパケット生成部
607
606
パケット送信部
データパケット
符号化PS
602
情報受信装置
パケット受信部
608
609
ビデオ復号部
610
モニタ
伝送帯域推定部
611
パケットサイズ要求部
612

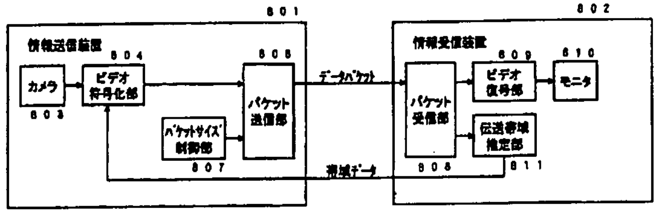
[Drawing 10]


スタート
パケット受信
S1001
$t_{2A}=TS$
$t_{2B}=$現時刻
$n_2=PS$
S1002
前パケット有効?
S1003
N
Y
$S=\frac{n_2-n_1}{(t_{2B}-t_{2A})-(t_{1B}-t_{1A})}$
S1004
S値出力
S1005
$t_{1A}=t_{2A}$
$t_{1B}=t_{2B}$
$n_1=n_2$
S1006

[Drawing 7]


701
情報送信装置
カメラ
703
704
ビデオ符号化部
705
符号化パケット生成部
テストパケット生成部
707
706
パケット送信部
データパケット
符号化パラメータ
702
情報受信装置
パケット受信部
708
709
ビデオ復号部
710
モニタ
伝送帯域推定部
711
符号化パラメータ要求部
712

[Drawing 8]


801
情報送信装置
803
カメラ
804
ビデオ符号化部
805
パケット送信部
807
パケットサイズ制御部
データパケット
帯域データ
802
情報受信装置
806
パケット受信部
809
ビデオ復号部
810
モニタ
811
伝送帯域推定部

[Translation done.]